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ABSTRACT

Papers presented and summaries of discussions at a 3-day conference which focused on screen displays for online catalogs are included in this report. Papers presented were: (1) "Suggested Guidelines for Screen Layouts and Design of Online Catalogs" (Joseph R. Matthews); (2) "Displays in Database Search Systems" (Fran Spigai); (3) "Critique of Online Display Screens" (Kent Norman); (4) "Online Catalog Screen Displays: A Human Factors Critique" (Christine L. Borgman); (5) "Bit Mapped Displays and Online Catalogs" (Alan Kay); and (6) "Conference Summary" (Joan Frye Williams). Several graphic illustrations accompany the text, and references are provided for four papers. Audience discussion is recorded following two reports, discussion group reports are presented, and final comments of conference participants are noted. A glossary, meeting agenda, and list of participants are appended. (KM)

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ONLINE CATALOG SCREEN DISPLAYS

A Series of Discussions

Report of a conference sponsored by
the Council on Library Resources

at the

Lakeway Conference Center
Austin, Texas

March 10-13, 1985

Bibliographic Service Development Program

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Bibliographic Service Development Program

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I. INTRODUCTION

These proceedings are the product of a three-day conference that focused on screen displays for online catalogs. Conference participants included librarians, system designers, vendors, and consultants. Discussion was lively and constructive. Clearly there is widespread interest in improving screen displays to enhance user satisfaction and performance.

The conference began with an online catalog fair. More than twenty systems were available for demonstration, evaluation, and "test drives."

Conference speakers addressed screen display issues from a number of perspectives. Joseph R. Matthews (President, J. Matthews and Associates) brought together applicable research results from many disciplines and formulated a set of possible guidelines for specific types of online catalog screen displays.

Fran Spigai (President, Database Services) traced the development of the user interface in the online reference services, contrasting the use of these services by professional searchers with the use of online catalogs by unsophisticated end users.

Christine Borgman (Assistant Professor, UCLA Graduate School of Library and Information Science) and Kent Norman (Associate Head, University of Maryland Human-Computer Interaction Lab) offered criteria for evaluating online screen displays, plus a general critique of the systems demonstrated at the online catalog fair.

Alan Kay (Apple fellow and developer of the bit map display) described a vision of what the user interface (or "illusion," as he put it) might be in the future.

Though individual contributions have been edited for clarity and readability, every attempt has been made to preserve the interactive, spontaneous flavor of the meeting. Alan Kay's conference segment, which included slides, films, videodisc images, and body language, presented what can only be described as an editorial moving target; it has been extensively (we hope not excessively) reorganized.

It is hoped that the papers and discussions in this volume will be a valuable resource for everyone who is involved in the planning and implementation of online catalogs.

II. SUGGESTED GUIDELINES FOR SCREEN LAYOUTS AND DESIGN OF ONLINE CATALOGS

Joseph R. Matthews

Central to the concept of an online catalog is the display of bibliographic and other information on a CRT screen. Yet each designer of the online catalog has developed a fairly unique approach to the issues of layout, content and sequence of data, typography, spacing, punctuation, and vocabulary (Matthews, 1984). Good computer systems must accommodate the ways that people read and understand CRT terminal displays (Landauer et al.).

As the one hundred or so installed online catalogs proliferate and users move from system to system, it becomes crucial that the user of the online catalog be presented with screens that are relatively similar in layout and content. This has important implications both for the system designer and for the user of the online catalog. For the system designer, familiar and relatively similar screen displays mean that the user will spend less time reading the screen; thus the time between the entry of command choices will be shorter. This means that the online catalog, an expensive resource, has the potential for more user transactions per hour. For the user, familiar screens mean less time will be needed to (re)learn the use of an online catalog in a variety of library settings.

Rather than yet another call to action, the following preliminary guidelines for screen layout and design are presented in an effort to spark discussion and become a focus for consensus building. An expanded set of guidelines could be developed and, over the course of the next several years, form the basis for a standard.

Good screen guidelines must emphasize:

- consistent display formats so the user knows where to look for information;
- consistent labeling of information;
- the value of brevity--displaying no more data than needed by the user; and
- efficient information assimilation by the user.

Consistency, the foundation of systems that are easy to learn, use, and remember, allows the user to form a simple conceptual model of the online catalog. When the designer's conceptual model of the online catalog closely parallels the model developed by the user through use of the system, the system can be called user friendly.

Brevity acknowledges that the human user is limited in the amount of information that can be absorbed in a given period of time. Ignoring this limitation will result in increased frustration and user errors. Overall screen density, often expressed as a percentage of the total character spaces available, measures the number of characters displayed. Local density, usually manipulated by altering line spacing, is an indicator of the number of filled spaces near each character. Low density should mean good user comprehension.

Compatibility--another desirable characteristic--minimizes the amount of information recoding that must be done by the user. Good compatibility ensures efficient information assimilation by the user. Related data should be grouped or "chunked" together (Stewart, 1976; Tullis, 1981). The layout complexity of a display should follow a predictable visual scheme (Tullis, 1983).

I will present some general guidelines first, followed by some specific guidelines that relate to different types of online catalog displays. References are given to indicate the degree of support that prior research, experience, and the synthesis of other work related to displays give to these guidelines.

Label Guidelines

Both in substance and in style, the following guidelines draw heavily from Smith and Aucella (1983). Throughout this discussion, frequently cited works are identified by the letters A - G. (See the References at the end of this paper for a complete list of citations.)

1. Labels Should Be Upper Case

Display labels in upper case only (B, C, Mehlmann, Smith, Vartabedian).

2. Labels Should Be Words, Not Abbreviations

3. Every Variable Should Be Labeled

Every variable or data element should have a distinct and meaningful name. Use of jargon should be avoided, including "librarianese" (Neville).

The choice of labels should be driven by what the majority of *users* call various data elements, not what librarians think has value. For example, do users know what is meant by "IMPRINT"?

4. Labels Should Be Right Justified

Labels should be right justified and placed to the left of the data field (C).

5. Separate Labels

Labels should be separated from data fields by a colon (:) and at least one blank space (C).

6. Label Length

The amount of space provided for labels should be at least 12 characters and no more than 20 characters.

7. Labels for Information Displayed in Columns

Columns should be clearly identified. There are several options for displaying column labels (see Figure 1):
a. UPPER CASE only
b. Underlined UPPER CASE
c. Upper case with hyphens, e.g., ---- UPPER CASE ------
d. Upper case in REVERSE VIDEO

Figure 1: OPTIONS FOR TABULAR LABELS

ALL CAPS

ALL CAPS WITH UNDERSCORE

----- ALL CAPS ------ (WITH HYPHENS)

ALL CAPS (WITH REVERSE VIDEO)

For example:

LINE # AUTHOR TITLE YEAR

LINE # AUTHOR TITLE YEAR

LINE # ------ AUTHOR ------------ -------- TITLE --------- YEAR

LINE #	AUTHOR	TITLE	YEAR
1	Stone, Allan A.	The abnormal personality	1976
2	Stone, Albert E.	The innocent eye: childh	1975
3	Stone, Albert E.	Twentieth century inter	1977
4	Gawain and the Green Knight	Sir Gawain and the Green	1968

At this time, there are no clear research results to indicate which type of label to use for information displayed in columns. In the face of a lack of research, I would recommend use of upper case with hyphens. Color displays may also help to solve this problem.

General Text Guidelines

1. Arrange Data Logically

   Arrange information in logical groups functionally (A, Swezey and Davis, Reynolds 1979, Reynolds 1980).

2. Mix Upper & Lower Case Text

   To improve legibility and help differentiate text from labels, general text should be displayed in mixed upper and lower case with conventional use of capitalization, i.e., to start sentences, to indicate proper nouns and acronyms, etc. (A, B, Poulton and Brown, Henney, Swezey and Davis, Tinker, Vartabedian).

   Should indexes that are not stored in upper case only be displayed in upper case only? Research suggests not.

3. End Sentences with a Period

   Every sentence should end with a period (B, C).

4. Little or No Hyphenation of Text

   Words should not be broken by hyphenation. Lines should be broken at words rather than splitting a word in two. Unjustified text lines are just as legible as right-margin justified text (A, B, Rehe).

   Ragged right hand margins are also probably easier to create than right-justified margins.

5. Left Justify Text

   Text should be left justified (E; F; Gregory and Poulton; Campbell, Merchetti and Mawhort).

The label should be right justified, followed by a colon, then a space, and then the text. There should be two parallel lines if you look straight down the middle of the display.

With labels right justified and text left justified, you have jagged edges on the outer margins and in the middle you have symmetry.

....

Question from the Audience: Are subject headings viewed as labels and should they be upper case?

Matthews: I don't know; there is no research on that. I think not.

....

6. Text Width of 55 Characters

   Text should include no more than 55-60 characters per line (C, Duchnicky and Kolers).

7. Highlighting

   The variable textual information should be highlighted, with the labels displayed in normal or dim intensity (F).

8. Paragraphs

   Paragraphs should be no longer than four (4) lines each. Paragraphs should be separated by a single blank line (Bradford).

Instructional Text Guidelines

Text for instructions, directions, help screens, and options should follow these guidelines:

1. Simple Sentence Structure

   Short, simple sentences should be used (A, C, F, G).

2. Affirmative Sentences

   Affirmative rather than negative statements should be used. Tell the user what to do, not what to avoid (A, F).

3. Active Voice

Sentences should be in the active voice because active voice sentences are easier to understand (A, F).

4. Temporal Sequence

The word order of sentences describing a sequence of actions should correspond to the sequence of activities (A, F).

Examples: (Good) Press RETURN to start a search.
(Bad) To start a search, press RETURN.

Don't ask the user to transpose the instruction.

5. Use Complete Words

Complete words, not contractions or short forms of a word, should be used (C, F).

6. Avoid Jargon

Words used should be familiar to the user. Avoid the jargon of librarians and computer programmers (A, B, C, E, F).

For example, in displays of authority information, the records related to a controlled vocabulary heading have been referred to as "references," "titles," "records," "items," "citations," and "papers." Are any of these terms more or less intelligible to users? We need more work in this area.

7. Consistent Wording

Word usage should be consistent, especially for terminology pertaining to the online catalog (A, B, C, F).

Example: If the word "screen" is to be used, then synonyms such as frame, display, etc., should be avoided.

I think we may need to develop a glossary so that we can call things by the same names regardless of the system we are in. We need to get away from the "not invented here" syndrome, the belief that vocabulary that originated somewhere else is not appropriate for my special needs.

8. Information Content

Only information essential to the user's needs should be displayed. Simplify all screens. However, all data pertinent to a particular information need, e.g., location and status information, should be displayed on the same screen (A, C, F, G, Martin, Morland, Mitchell).

9. Information Density

The total amount of information to be displayed at any one time should be carefully controlled. No more than 30% of available character spaces should be used--15% is recommended (A; Ramsey and Atwood; Coffey, 1961; Poulton and Brown, 1968; Schultz, 1961; Green, 1953; Dodson and Shields, 1978; Danchak, 1976; Shields, 1980).

Users always perceive that the screen is more filled with information than it actually is (Bradford, Tinker).

Screen Layout Guidelines

1. Identify Screens

For screen or page-based systems, every screen should display the user's input which led to the current screen. If this information is not incorporated as a part of the system's response to the user, it should be displayed in the upper right hand-corner of the screen.

2. Organization of Data

The organization and location of displayed data elements should be standardized. This permits the user to develop spatial expectations. Data should be presented using spacing, grouping, and columns to produce an orderly and legible display (A; B; C; Tullis, 1981; Parrish et al.).

3. Screen Segments

The screen should be divided into three segments (top, middle, and bottom), with each segment reserved for specific functions. For example, the top of the screen usually shows how the user got the present screen, the middle of the screen presents the current information, and the bottom of the screen is typically reserved for the display of options available to the user (B, C, E, G).

4. Dashed Lines

Dashed lines may be used to segment the screen (D).

The following sections give specific guidelines for the layout of a number of different types of screen displays. Guidelines which apply to more than one type of display are repeated.

Screen Layout - Authority Display

There is little guidance to date for this area. For example, should the records associated with a heading precede or follow that heading? Should the main heading (material preceding the first --) be repeated or should it be displayed once with the subheadings indented on following lines? There are some things we do know, however:

1. Line Numbers

Lists of items continued on the next page (scrolled) should be numbered relative to the first item on the initial page (A, B).

On some systems, you look at ten items, then go to the next page for ten more and they are numbered one through ten again; you go to the third page and they are numbered one through ten. How can the user keep track? That is the issue.

2. Order of Items

Items in a list should be arranged in some recognizable and useful order, such as chronological, alphabetical, or degree of importance (A, G).

Last-in-first-out is generally not a useful display sequence.

3. Data Elements Included

Data elements to be included in a multiple line (record) display are:

- Line number
- Authority heading
- Number of related records

What sequence these elements should appear in has not been addressed, though I assume the line number should come first.

4. Tabular Displays

When multiple data elements appear on a single line (e.g., line number, authority heading(s), number of related records) the data elements should be broken into separate blocks--tabular display--and not run together and separated with slashes (C, Ramsey and Atwood, Cropper and Evans).

5. Label Column Displays

To reduce misunderstandings and increase efficient information assimilation by the user, all columns should have a column heading label (A, B, G).

Screen Layout - Multiple Line Display

1. Line Numbers

Lists of items continued on the next page (scrolled) should be numbered relative to the first item on the initial page (A, B).

2. Order of Items

Items in a list should be arranged in some recognizable and useful order, such as chronological, alphabetical, or degree of importance (A, G).

3. Data Elements Included

Data elements to be included in a multiple line (record) display are:
- Line number
- First (N) characters of the author
- First (N) characters of the title
- Year published

Note: Of 18 online catalogs recently reviewed, 17 include the title (truncated), 15 the author (truncated), 13 the line number, 7 the call number, 9 the year, 4 the location, 2 the publisher, and 1 the record ID.

Perhaps the data elements to be included vary by type of search. For example, for an author search, assuming the author's name being searched is displayed once, the data elements to be displayed in tabular form include line number, title, and year published. (Perhaps call number?) For a title or author/title search, the data elements to be displayed in tabular form include: line number, author, title, and year published.

4. Tabular Displays

When multiple data elements appear on a single line, e.g., line number, author (truncated), title (truncated), year, etc., the data elements should be broken into separate blocks--tabular display--and not run together and separated with slashes (C, Ramsey and Atwood, Cropper and Evans).

5. Label Column Displays

To reduce misunderstandings and increase efficient information assimilation by the user, all columns should have a column heading label (A, B, G).

Screen Layout - Single Brief Record Display

This display provides a brief record; one or more records may be displayed on a single screen.

Note: If a search retrieves a single record, the system should automatically display the record in a (default) single brief record display. Most systems require the user to enter another character and hit RETURN even if there is only one choice to be displayed.

1. Layout

The layout or format of a brief record should not be the traditional 3 X 5 card catalog format but rather a structured, labeled format (Fryser, 1981).

Note: Of 14 sample displays, 7 use a structured, labeled format.

2. Label Every Variable

Every variable or data element should have a distinct and meaningful name. Use of jargon in the labels, including librarianese, should be avoided (Neville).

3. Information Content

Only information essential to the user's needs should be displayed (A, C, F, G). A number of observers have suggested that users of the catalog actually use little of the data presented (Wallace, Seal et al.).

Screen Layout - Medium or Full Record Display

This display provides most or all of the full MARC record. (The display may therefore require more than one screen.)

1. Layout

The layout or format of a record should not be the traditional 3 X 5 card catalog format but rather a structured, labeled format (Fryser, 1981). And related data, e.g., author and added author entries, should be combined in the display of the online catalog.

Note: Of 14 sample displays, 7 use a structured, labeled format.

2. Label Every Variable

Every variable or data element should have a distinct and meaningful name. Use of jargon in the labels, including librarianese, should be avoided (Neville).

Screen Layout - Copy and Status Display

To the extent possible, the use of a tabular layout is recommended. Labels should be capitalized and text should use upper and lower case characters.

Conclusions

1. It is possible to develop valid guidelines for the display of bibliographic and related information on the screen of a CRT terminal. And now is the time to do so--before the number of online catalogs grows too large. Some similarity exists now.

2. The display guidelines should employ principles based on available research. These guidelines should be used consistently, whenever a system designer chooses to employ a particular feature or display.

3. The guidelines could, over the course of time, become a standard.

4. Standard nomenclature is required now to identify and describe the various elements and screens of the online catalog.

5. A standard for the names of different data elements is also needed now. Again, the names should be what a majority of users call a particular data element, not what librarians and system designers think a label should be called.

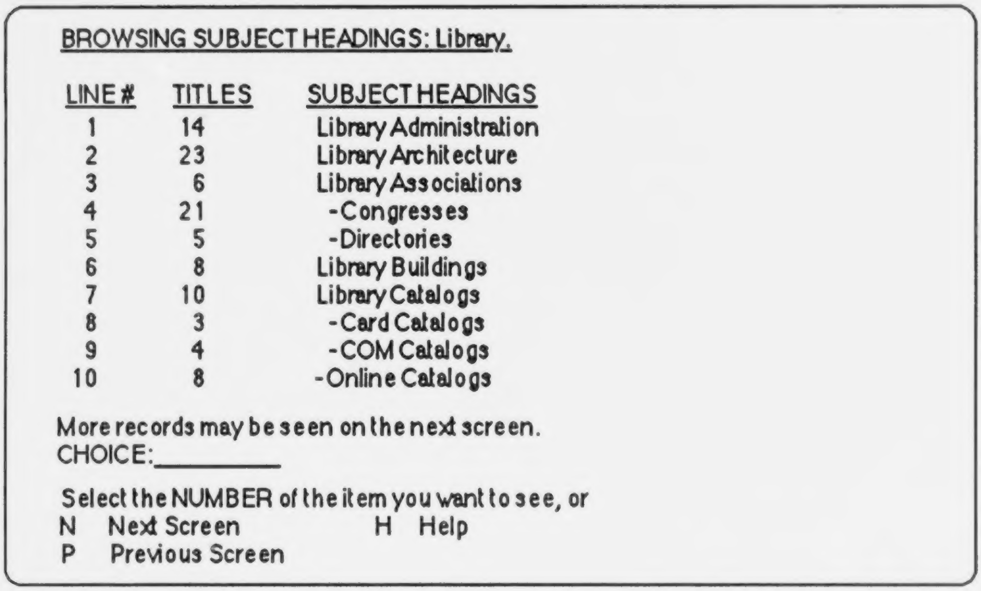
6. Research, sponsored by the Council on Library Resources, may be needed to help determine what users prefer to call different data elements.

7. Research, sponsored by the Council on Library Resources, is needed to help determine which of the various data elements, and in which sequence, are needed by users. For example, should a brief display provide author, title, series, publisher, subjects, contents notes OR title, series, author, publisher, year, subjects OR ?

   We need to format the display from the user's perspective.

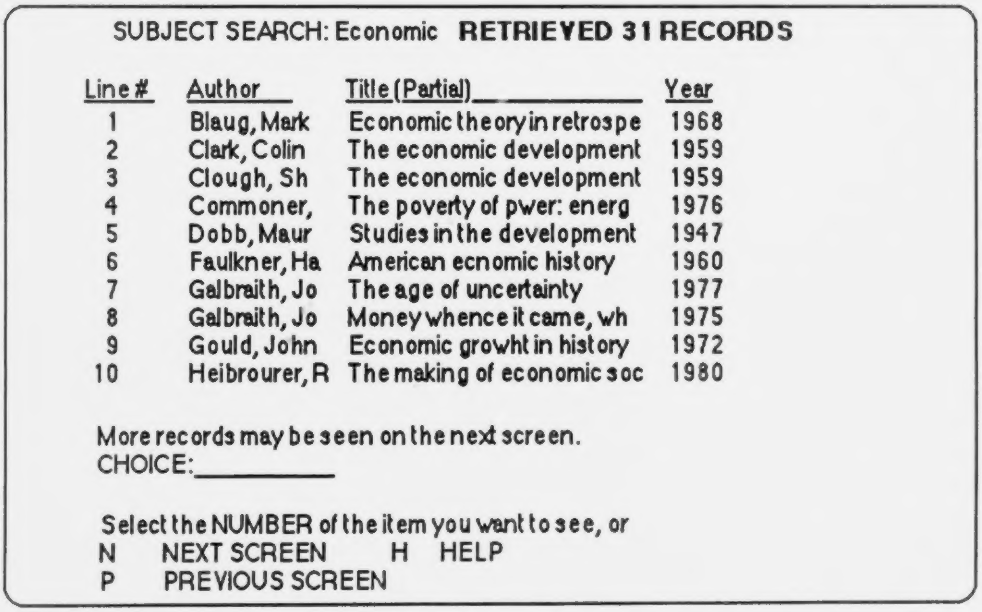
Postscript: Using the above guidelines, sample screens (derived from several systems) are presented to illustrate the potential of good screen design for an authority display, a multiple line display, a single brief record display, and a full record display.

FIGURE 2: SAMPLE AUTHORITY DISPLAY



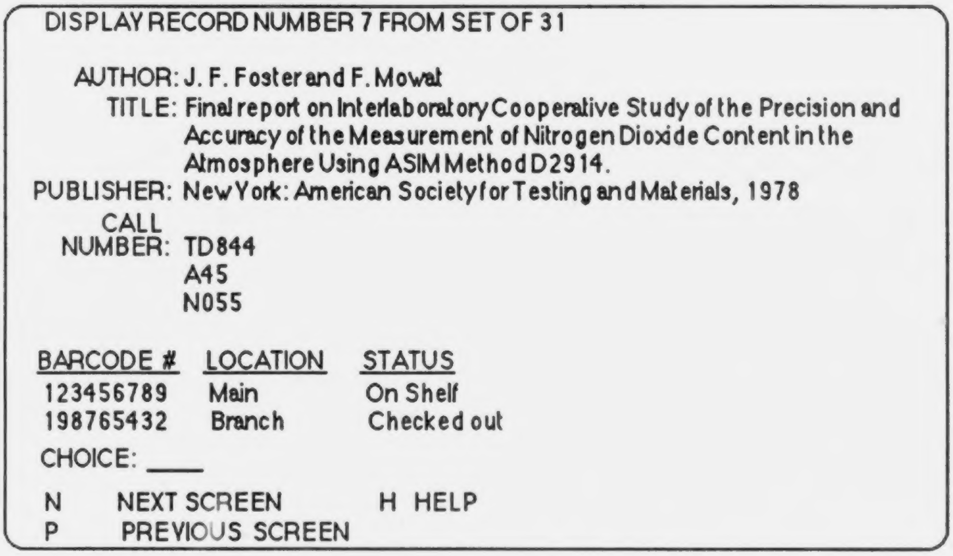
```
BROWSING SUBJECT HEADINGS: Library.

LINE #   TITLES   SUBJECT HEADINGS
  1        14      Library Administration
  2        23      Library Architecture
  3         6      Library Associations
  4        21        -Congresses
  5         5        -Directories
  6         8      Library Buildings
  7        10      Library Catalogs
  8         3        -Card Catalogs
  9         4        -COM Catalogs
 10         8      -Online Catalogs

More records may be seen on the next screen.
CHOICE:__________

Select the NUMBER of the item you want to see, or
N   Next Screen              H   Help
P   Previous Screen
```

FIGURE 3: SAMPLE MULTIPLE LINE ENTRY



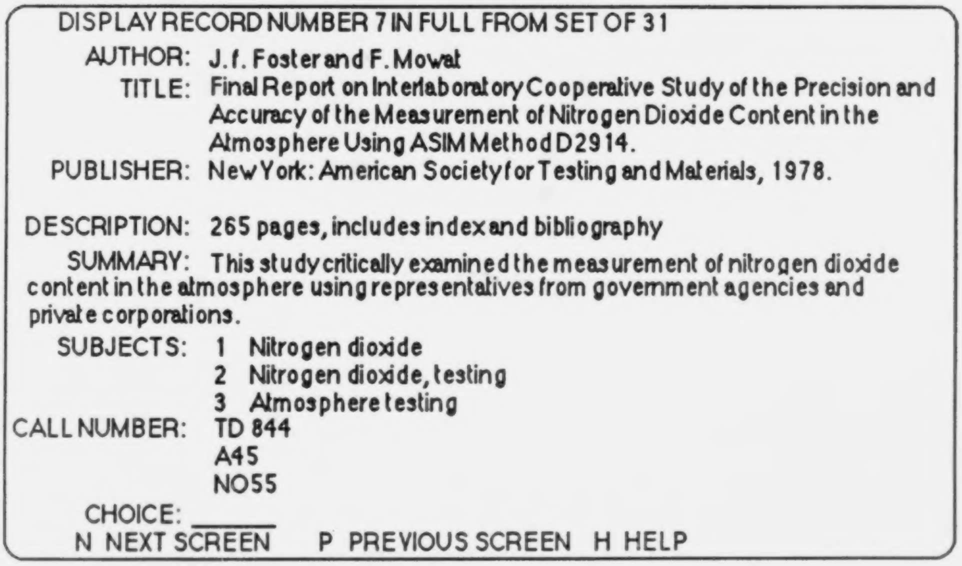
```
SUBJECT SEARCH: Economic   RETRIEVED 31 RECORDS

Line #   Author          Title (Partial)              Year
  1      Blaug, Mark     Economic theory in retrospe  1968
  2      Clark, Colin    The economic development     1959
  3      Clough, Sh      The economic development     1959
  4      Commoner,       The poverty of pwer: energ   1976
  5      Dobb, Maur      Studies in the development   1947
  6      Faulkner, Ha    American ecnomic history     1960
  7      Galbraith, Jo   The age of uncertainty       1977
  8      Galbraith, Jo   Money whence it came, wh     1975
  9      Gould, John     Economic growht in history   1972
 10      Heibrourer, R   The making of economic soc   1980

More records may be seen on the next screen.
CHOICE:__________

Select the NUMBER of the item you want to see, or
N   NEXT SCREEN       H   HELP
P   PREVIOUS SCREEN
```

FIGURE 4: SAMPLE BRIEF RECORD DISPLAY



```
DISPLAY RECORD NUMBER 7 FROM SET OF 31

   AUTHOR: J. F. Foster and F. Mowat
    TITLE: Final report on Interlaboratory Cooperative Study of the Precision and
           Accuracy of the Measurement of Nitrogen Dioxide Content in the
           Atmosphere Using ASIM Method D2914.
PUBLISHER: New York: American Society for Testing and Materials, 1978
     CALL
   NUMBER: TD844
           A45
           N055

BARCODE #   LOCATION   STATUS
123456789   Main       On Shelf
198765432   Branch     Checked out

CHOICE: ____

N     NEXT SCREEN        H  HELP
P     PREVIOUS SCREEN
```

FIGURE 5: SAMPLE FULL RECORD DISPLAY



```
DISPLAY RECORD NUMBER 7 IN FULL FROM SET OF 31
      AUTHOR: J.f. Foster and F. Mowat
       TITLE: Final Report on Interlaboratory Cooperative Study of the Precision and
              Accuracy of the Measurement of Nitrogen Dioxide Content in the
              Atmosphere Using ASIM Method D2914.
   PUBLISHER: New York: American Society for Testing and Materials, 1978.

 DESCRIPTION: 265 pages, includes index and bibliography
     SUMMARY: This study critically examined the measurement of nitrogen dioxide
content in the atmosphere using representatives from government agencies and
private corporations.
    SUBJECTS: 1  Nitrogen dioxide
              2  Nitrogen dioxide, testing
              3  Atmosphere testing
 CALL NUMBER: TD 844
              A45
              NO55
      CHOICE: ______
   N NEXT SCREEN      P PREVIOUS SCREEN   H HELP
```

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DISCUSSION

Salmon: We've actually talked quite a bit to users about one of the issues you mentioned--displaying one record automatically. Doing that seems to violate another principle--consistency. If, most of the time, users have to request a display, but sometimes it just appears automatically, that seems to upset them.

Matthews: The user enters a search and retrieves one record. Instead of displaying a brief record and then saying, "If you want holdings and status information, hit RETURN," the system should display the record, with the message that only one was retrieved and here it is. We now do it the other way--as a two part response--based on comments from "users." But we've mistakenly defined the "user" as a librarian.

Comment from the Audience: First, it's important to point out that guidelines are well and good but they probably get in the way. For example, standards are often set in the computer business, but by the time the standards are set, that line of computers is completely obsolete. By the time they had a standard for the S100 bus, nobody was making them anymore. The technology is evolving so quickly that to make a standard now--even for nomenclature--could possible be a mistake.

Second, guidelines are fine, but in practice there must be compromises. The needs of the system may conflict with the needs of the user.

Third, most of these things can't be decided just by rational discussion. They require empirical research. The validity of the guidelines depends on the validity of the data. Much of the data we now have has been collected under very poorly controlled conditions. To base standards on these poorly collected data would also be a mistake.

Matthews: Your points are well taken. Guidelines should be independent of any specific technology. They are independent of whether your system runs with an S100 bus, an Intel chip, or whatever. I'm talking about what the user interacts with, what the user sees.

The argument is that it's too early; too much is changing. Guidelines are not meant to be set in concrete but are meant to be based on research, on available data. The guidelines will change as we learn more. There is currently so much diversity that it is confusing when the user goes from one system to another, even in the same town. For example, the Evanston Public Library has CLSI and Northwestern University has NOTIS. Users become confused when they have to switch back and forth between systems.

Comment from the Audience: I think we have to have some standardization, but leave us room for a little diversity.

Matthews: Sounds like we're going to have some great discussion groups!

Let me go through a few sample displays now. The first ones are authority displays.

Example #1: Somebody entered LIBRARY CATALOGS and this is what they got back. Notice that there are no line numbers. The data is all in upper case. There is some information preceding the search term (the first six lines), then the term itself (line seven), and then all the stuff after it.

Comment from the Audience: The subdivision punctuation is lost.

Matthews: Let me play devil's advocate. Do the users care?

Example #2: Here we are browsing a term file. We entered an author search for THOMAS PYNCHON. We've got some "B" numbers--those stand for BROWSE, as opposed to F numbers, for FIND. Notice how everything is run together. There are some separators--slashes. It's much more difficult to read this display.

EXAMPLE #1

```
ENTER OPTION   LIBRARY CATALOGS

    TO CONTINUE WITH SUBJECT LISTING PLEASE ENTER YES

LIBRARY ADMINISTRATION
LIBRARY ARCHITECTURE
LIBRARY ASSOCIATIONS
LIBRARY ACCOCIATIONS CONGRESSES
LIBRARY ASSOCIATION DIRECTORIES
LIBRARY BUILDINGS
LIBRARY CATALOGS
LIBRARY CATALOGS AND READERS
LIBRARY CONFERENCE U S COLORADO
LIBRARY COOPERATION
LIBRARY COOPERATION U S DIRECTORIES
LIBRARY DECORATION
```

EXAMPLE #2

```
BRWS TERM FILE LCCC: ENTRY TERM PYNCHON, THOMAS
BO1 PYN-BANK WEDERSPROKEN EN BEMATIGT//(TITL=1)
BO2 PYNAERT,L//(AUTH=1)
BO3 PYNCHON//(TITL=2)
BO4 PYNCHON, JOHN¬//(INDX=1)
BO5 PYNCHON. THE VOICE OF AMBIGUITY//(TITL=1)
BO6 + PYNCHON, THOMAS¬//(AUTH=3,INDX=13)
BO7 PYNCHON, WILLIAM¬//(INDX=1)
BO8 PYNCHON'S FICTIONS//(TITL=1)
BO9 PYNCHONS OF SPRINGFIELD//(TITL=1)
B10 PYNE FAMILY//(INDX=1)
B11 PYNE PRESS//(CORP=3)
B12 PYNE, CHARLES CLAUDE//(AUTH=1)
B13 PYNE,GOULD, GUINESS LTD//(INDX=1)
B14 PYNE, GOULD, GUINESS LTD//(TITL=1)
B15 PYNE, NANCY//(AUTH=1,INDX=1)
B16 PYNE, PATRICIA//(AUTH=1)
READY FOR NEW COMMAND (FOR NEXT PAGE, XMIT ONLY);sbb
```

Example #3: We are looking for the subject "Neoplasms." We've got line numbers, but notice what comes after the line numbers--right parens, then the word, then what do we have after that in parentheses? What are those numbers? *We* know that those are the number of records associated with that subject heading, but does the user know that? I don't think so. Here we have upper and lower case and we've even got dash dashes.

Question: Is 84 the sum of all the records that either match or partially match?

Matthews:: For line one, 84 records are associated (match) just with Neoplasms.

Example #4: The user has searched for the subject "Executives." Here we get Executives, Executives--Salaries, pensions, etc. Notice that there are no labels to tell you that these are line numbers. Text is in upper and lower case and we do have hyphens.

Example #5: Notice we've got some labels. Here is an example of the variation in terminology. We have "citations" instead of "references" or "items," which we saw previously. But the label is not underlined or in all caps.

EXAMPLE #3

```
LOOKING FOR SUBJECT: Neoplasms
 1) Neoplasms  (84)
 2) Neoplasms--atlases  (1)
 3) Neoplasms--audiocassettes  (1)
 4) Neoplasms--bibliography  (3)
 5) Neoplasms--biography--videocassettes  (6)
 6) Neoplasms--chemically induced  (5)
 7) Neoplasms--chemically induced--congresses  (10)
 8) Neoplasms--classification  (7)
 9) Neoplasms--collected works  (2)
10) Neoplasms--complications  (11)
11) Neoplasms--complications--congresses  (2)
12) Neoplasms--congresses  (40)

Select subheadings to be searched by typing numbers separated by commas or A
for all

...THEN, press RETURN for more subheadings; ESC for more subjects
Which one(s)? 2
```

EXAMPLE #4

```
You searched for the SUBJECT        =Executives
   4 SUBJECTS found, representing 11 items, records 1-4 are:

   1 >Executives ............................................. 6 items
   2 >Executives -- salaries, pensions, etc........... 2 items
   3 >Executives -- united states.......................... 1 item
   4 >Executives -- united states -- interviews....... 2 items
```

EXAMPLE #5

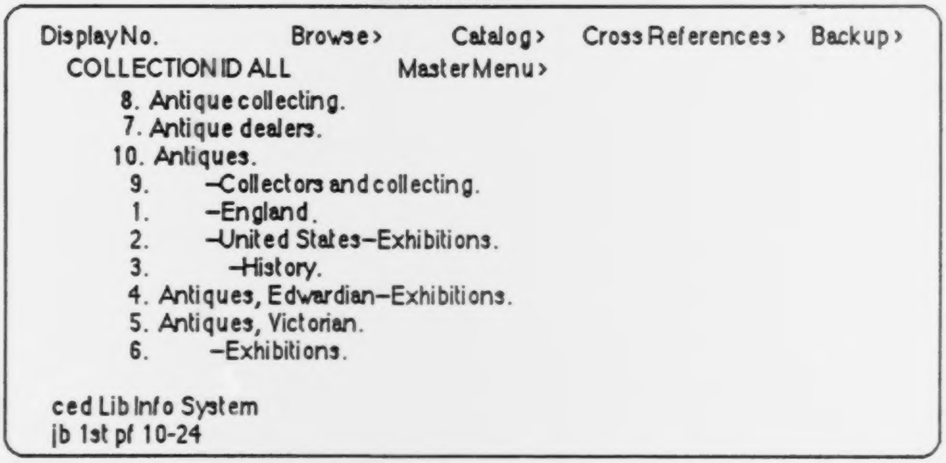
```
D14 THE UNIVERSITY LIBRARY      GEAC LIBRARY SYSTEM    SUB KEYWORD
                                                          SEARCH
Your subject SOLAR                                     matches 6 subjects

                                                       No. of citations
                                                       in entire catalog

              1 Architecture and solar radiation                 1
              2 Solar cells                                      3
              3 Solar collectors                                 2
              4 Solar energy -- Economic aspects                 1
              5 Solar energy -- Economic aspects -- United States  1

 Type a number to see more information - OR -
   CAT - begin a new search

 Enter number or code: 5||4                          Then press SEND
```

Example #6: There are no labels for the line numbers or the headings. I'm not sure that users would understand what the sequence of numbers 8, 7, 10, 9, 1, 2, 3, 4, 5, 6 means. Those of you who have WLN-based systems will understand that. The hierarchy is interesting. You can see that under Antiques we've got Collectors and collecting, England, and United States, and under United States we also have History.

Example #7: We have headings that are all upper case. We have the dashes but no labels. Again we have a string of numbers that are not labeled, stuck out in the far righthand column. Let's pick MARITIME LAW--CHILE and read across. How many records are associated with that heading? How about MARITIME LAW--CONGRESSES? How many records? It takes a while to line these up. Setting the numbers all the way over to the right side imposes some real constraints on the user. Maybe the number of citations needs to be between the line number and the heading, but then you are introducing some additional complexity. We need to work on this, wouldn't you say?

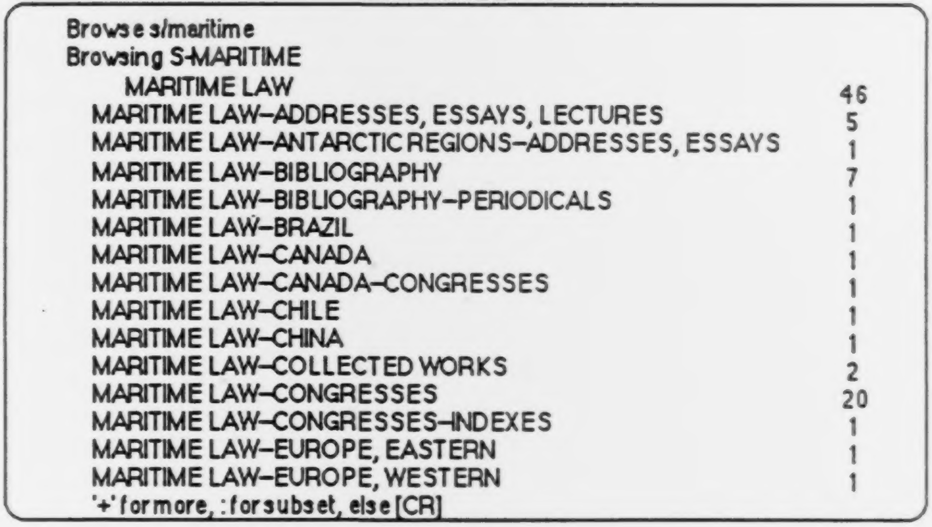
Example #8: We've got some upper and lower case data. It says "Searching subject," but again there are no labels for the information.

EXAMPLE #6



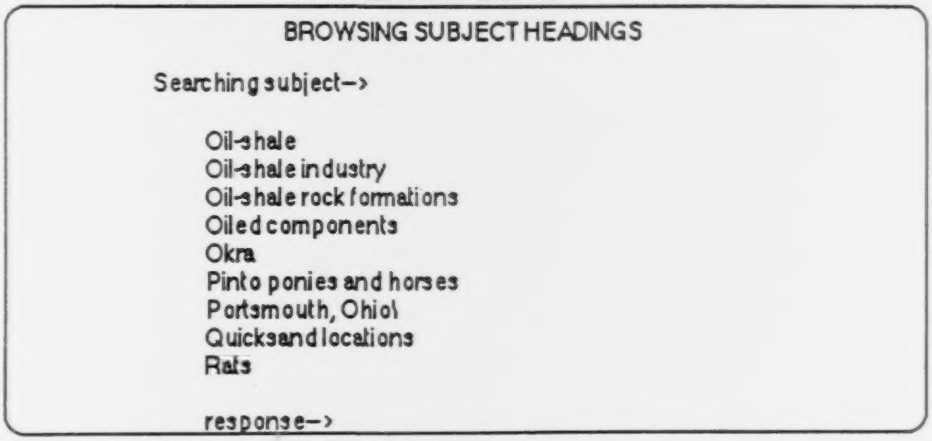
```
DisplayNo.              Browse>      Catalog>     Cross References>    Backup>
  COLLECTION ID ALL                MasterMenu>
        8. Antique collecting.
        7. Antique dealers.
       10. Antiques.
        9.       -Collectors and collecting.
        1.       -England.
        2.       -United States-Exhibitions.
        3.           -History.
        4. Antiques, Edwardian-Exhibitions.
        5. Antiques, Victorian.
        6.       -Exhibitions.

 ced Lib Info System
 jb 1st pf 10-24
```

EXAMPLE #7



```
Browse s/maritime
Browsing S-MARITIME
     MARITIME LAW                                                    46
  MARITIME LAW-ADDRESSES, ESSAYS, LECTURES                            5
  MARITIME LAW-ANTARCTIC REGIONS-ADDRESSES, ESSAYS                    1
  MARITIME LAW-BIBLIOGRAPHY                                           7
  MARITIME LAW-BIBLIOGRAPHY-PERIODICALS                               1
  MARITIME LAW-BRAZIL                                                 1
  MARITIME LAW-CANADA                                                 1
  MARITIME LAW-CANADA-CONGRESSES                                      1
  MARITIME LAW-CHILE                                                  1
  MARITIME LAW-CHINA                                                  1
  MARITIME LAW-COLLECTED WORKS                                        2
  MARITIME LAW-CONGRESSES                                            20
  MARITIME LAW-CONGRESSES-INDEXES                                     1
  MARITIME LAW-EUROPE, EASTERN                                        1
  MARITIME LAW-EUROPE, WESTERN                                        1
  '+' for more, : for subset, else [CR]
```

EXAMPLE #8



```
                       BROWSING SUBJECT HEADINGS

         Searching subject->

             Oil-shale
             Oil-shale industry
             Oil-shale rock formations
             Oiled components
             Okra
             Pinto ponies and horses
             Portsmouth, Ohio\
             Quicksand locations
             Rats

             response->
```

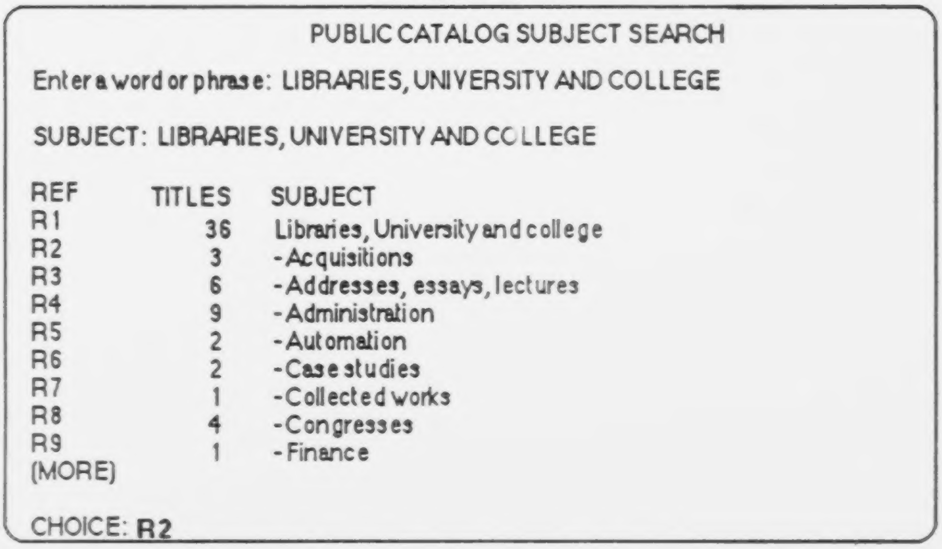
Example #9: We've got TITLES instead of "references" or "citations" or whatever, and we've got SUBJECT. They have introduced another line feed there to space things out. The questions are: Should the labels be upper case only? Should they be caps underlined? Should they be caps with hyphens surrounding to indicate the length of the field? That's something for the discussion groups to consider.

Example #10: The display is in upper and lower case. The number of items is indicated on the right. Again we have no labels, but you notice the little string of periods helps you follow over to figure out what that is.

Question from the Audience: Why are the authors' first names in lower case? That looks very odd.

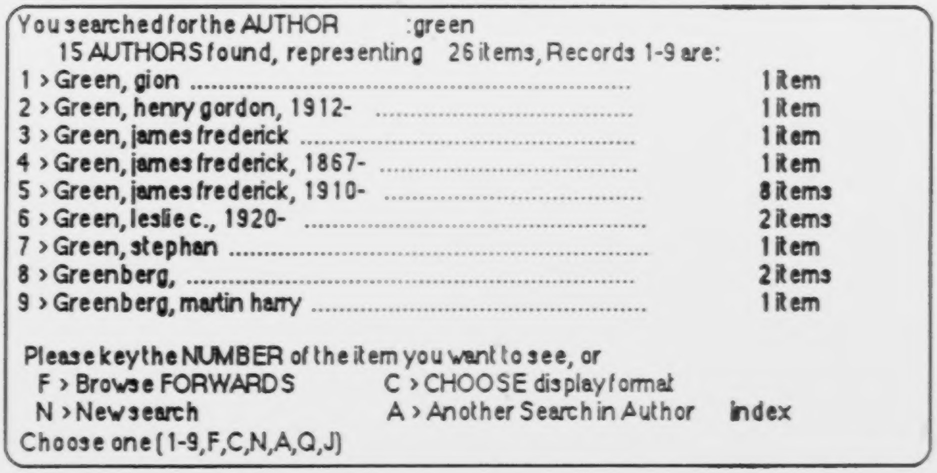
Matthews: Probably the index is all stored as upper case and they used a real quick and dirty approach to the display.

EXAMPLE #9



```
                    PUBLIC CATALOG SUBJECT SEARCH

Enter a word or phrase:  LIBRARIES, UNIVERSITY AND COLLEGE

SUBJECT:  LIBRARIES, UNIVERSITY AND COLLEGE

REF       TITLES    SUBJECT
R1           36     Libraries, University and college
R2            3     -Acquisitions
R3            6     -Addresses, essays, lectures
R4            9     -Administration
R5            2     -Automation
R6            2     -Case studies
R7            1     -Collected works
R8            4     -Congresses
R9            1     -Finance
(MORE)

CHOICE: R2
```

EXAMPLE #10



```
You searched for the AUTHOR         :green
   15 AUTHORS found, representing    26 items, Records 1-9 are:
1 > Green, gion ........................................          1 item
2 > Green, henry gordon, 1912-  ........................          1 item
3 > Green, james frederick .............................          1 item
4 > Green, james frederick, 1867-  .....................          1 item
5 > Green, james frederick, 1910-  .....................          8 items
6 > Green, leslie c., 1920-  ...........................          2 items
7 > Green, stephan .....................................          1 item
8 > Greenberg, .........................................          2 items
9 > Greenberg, martin harry ............................          1 item

Please key the NUMBER of the item you want to see, or
  F > Browse FORWARDS            C > CHOOSE display format
  N > New search                 A > Another Search in Author     index
Choose one (1-9,F,C,N,A,Q,J)
```

Example #11: This has all kinds of wonderful things. There are no labels. We have line numbers and then we have some codes: asterisks, x's and x slash; that's a good one. I love it when I see an authority display in the online catalog and I see X and XX. That's just wonderful; that really communicates a lot. It only communicates to me because I have been thumped up against it enough times to know what it means. Or S and SA--those are real good too. Then we have a whole string of numbers on the right hand side again.

Comment from the Audience: I like the numbers on the left: 1,2,3,3,5,5....

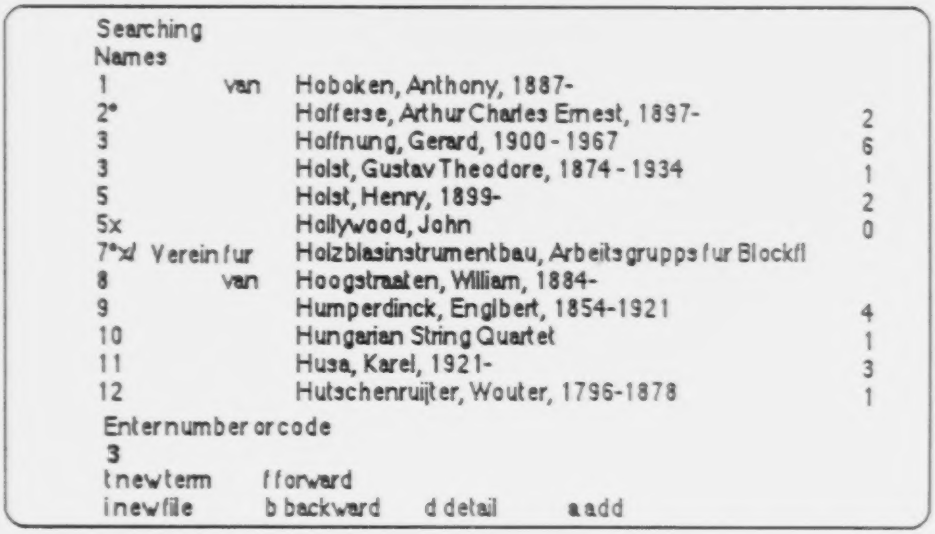
Matthews: Obviously we have a little bug in the system there. It can't count--might have hiccupped or something.

Example #12: Here's an interesting one. It's just a bunch of listings. There are no line numbers and there is no other information associated with it. It is all upper case.

Comment from the Audience: Depending on the system, not having line numbers may not be important. If it's very clear what the other text is, additional information may add to the user's confusion.

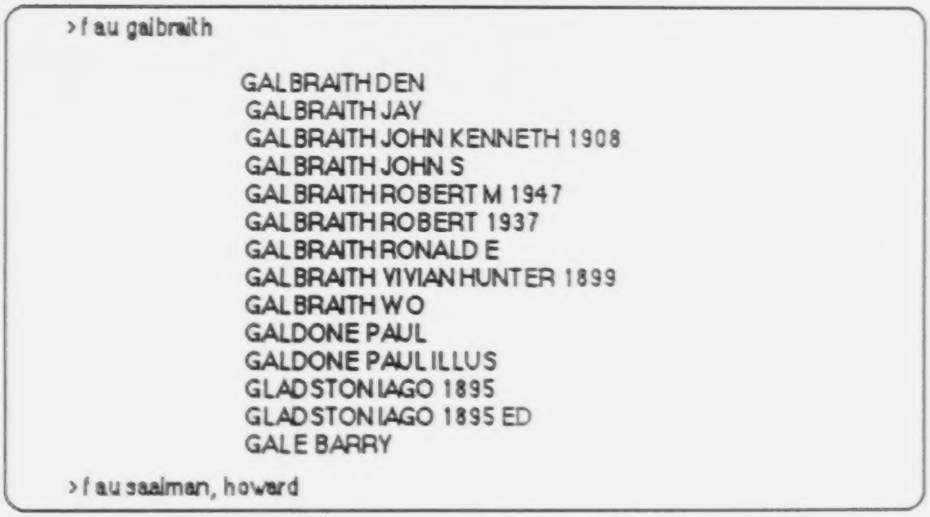
Matthews: As it happens the user is asked to rekey his or her choice. Isn't that fun? If the user were asked to move a cursor or a space bar/highlighter to make a selection, this might not be such a problem. But again, the guidelines are meant to say, if you are going to employ a technique, this is what you should do. If you have a new technology that makes things a little bit easier for the user, use it.

EXAMPLE #11



```
Searching
Names
1          van   Hoboken, Anthony, 1887-
2*               Hofferse, Arthur Charles Ernest, 1897-                   2
3                Hoffnung, Gerard, 1900 - 1967                            6
3                Holst, Gustav Theodore, 1874 - 1934                      1
5                Holst, Henry, 1899-                                      2
5x               Hollywood, John                                          0
7*x/  Verein fur Holzblasinstrumentbau, Arbeitsgrupps fur Blockfl
8          van   Hoogstraaten, William, 1884-
9                Humperdinck, Englbert, 1854-1921                         4
10               Hungarian String Quartet                                 1
11               Husa, Karel, 1921-                                       3
12               Hutschenruijter, Wouter, 1796-1878                       1
 Enter number or code
 3
 t newterm     f forward
 i newfile     b backward     d detail      a add
```

EXAMPLE #12



```
>f au galbraith

                 GALBRAITH DEN
                 GALBRAITH JAY
                 GALBRAITH JOHN KENNETH 1908
                 GALBRAITH JOHN S
                 GALBRAITH ROBERT M 1947
                 GALBRAITH ROBERT 1937
                 GALBRAITH RONALD E
                 GALBRAITH VIVIAN HUNTER 1899
                 GALBRAITH W O
                 GALDONE PAUL
                 GALDONE PAUL ILLUS
                 GLADSTON IAGO 1895
                 GLADSTON IAGO 1895 ED
                 GALE BARRY

>f au saalman, howard
```

Here we start dealing with multiple line displays. And here there is more similarity; we will see that as we go along.

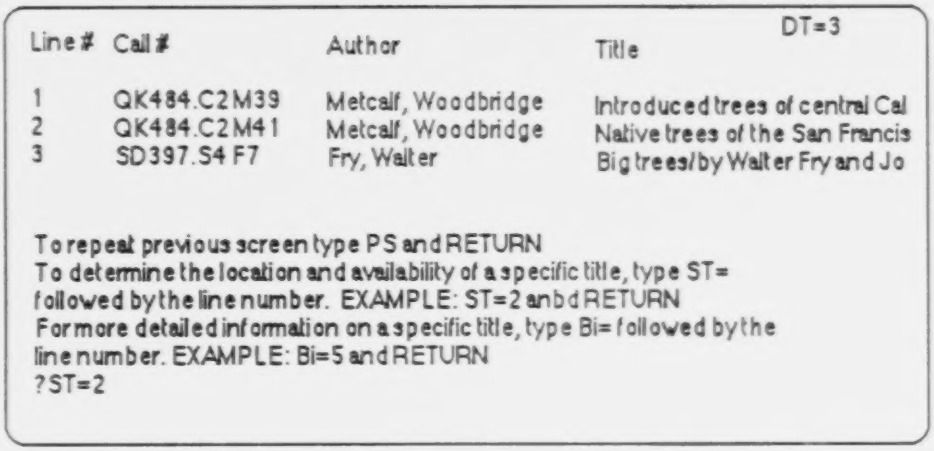
Example #13: We have a title search. We are seeing Line number, Call number, Author, and Title. Notice that the labels are in upper and lower case.

Question from the Audience: What is DT=3 in the upper righthand corner?

Matthews: Since I know the system, DT=3 means "Display title 3."

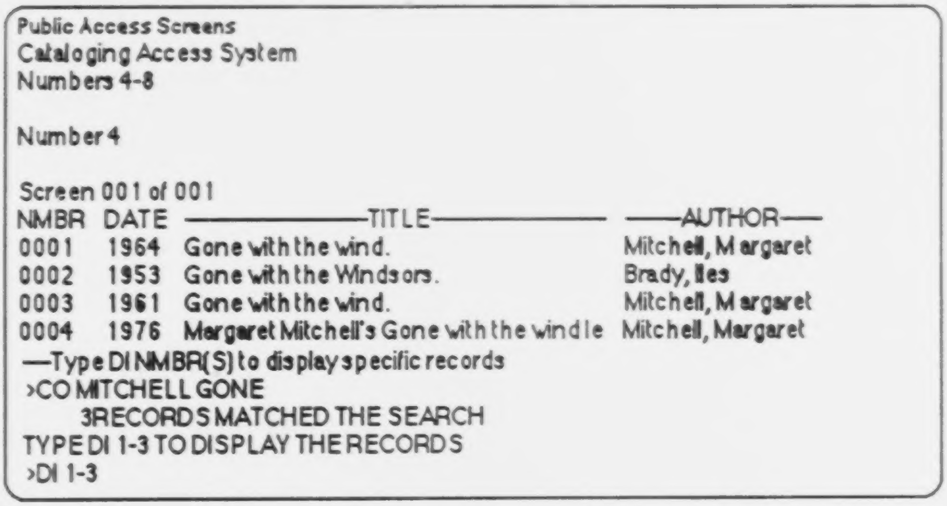
Example #14: We've got some indication that this is screen one of one. We've got a NMBR, but what kind of a number is that? Is that a line number? Is that a reference number? You have to stop and think a little to get "number" out of NMBR. They do use hyphens to help space the labels and field lengths.

EXAMPLE #13



```
                                                             DT=3
Line#  Call#               Author                 Title

1      QK484.C2M39         Metcalf, Woodbridge    Introduced trees of central Cal
2      QK484.C2M41         Metcalf, Woodbridge    Native trees of the San Francis
3      SD397.S4 F7         Fry, Walter            Big trees/by Walter Fry and Jo


To repeat previous screen type PS and RETURN
To determine the location and availability of a specific title, type ST=
followed by the line number.  EXAMPLE: ST=2 anbd RETURN
For more detailed information on a specific title, type Bi= followed by the
line number. EXAMPLE: Bi=5 and RETURN
?ST=2
```

EXAMPLE #14



```
Public Access Screens
Cataloging Access System
Numbers 4-8

Number 4

Screen 001 of 001
NMBR  DATE  ——————————TITLE——————————             ———AUTHOR———
0001  1964  Gone with the wind.                   Mitchell, Margaret
0002  1953  Gone with the Windsors.               Brady, Iles
0003  1961  Gone with the wind.                   Mitchell, Margaret
0004  1976  Margaret Mitchell's Gone with the windle  Mitchell, Margaret
—Type DI NMBR(S) to display specific records
>CO MITCHELL GONE
     3RECORDS MATCHED THE SEARCH
TYPE DI 1-3 TO DISPLAY THE RECORDS
>DI 1-3
```

Example #15: About the middle of the screen is a line that reads "The age of uncertainty." On this system, selections are made with a bar that gets moved down line by line. On the screen it appears as reverse video.

Salmon: Is that a 130 column display?

Matthews: That's an 80 column display. Notice that there are still no labels. We have call number, author, title, and year. Since they use a different technology (that moving bar), they are not using line numbers--which is probably OK in their particular case.

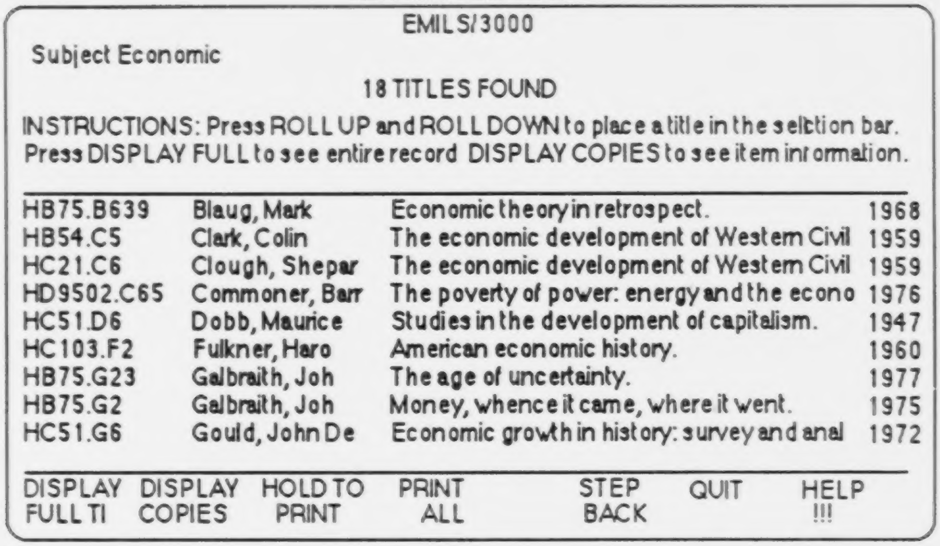
Hildreth: You say this is OK, but doesn't the user have to do a lot more work to make a selection using this approach?

Matthews: They have to hold down the space bar to get the selector to go down. There is also a function key that lets them back up--or "roll up and roll down."

Example #16: We again have no labels. There is upper and lower case data. Here we are repeating the author Michener each time. For the title Centennial we get separate listings for different editions. They are different bibliographic records.

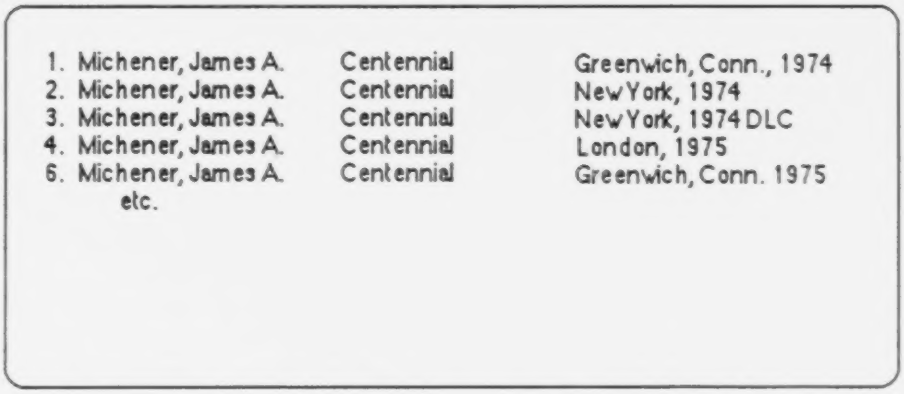
44

EXAMPLE #15



```
                              EMILS/3000
Subject Economic
                           18 TITLES FOUND
INSTRUCTIONS: Press ROLL UP and ROLL DOWN to place a title in the selction bar.
Press DISPLAY FULL to see entire record DISPLAY COPIES to see item inrormation.
--------------------------------------------------------------------------------
HB75.B639     Blaug, Mark       Economic theory in retrospect.                1968
HB54.C5       Clark, Colin      The economic development of Western Civil     1959
HC21.C6       Clough, Shepar    The economic development of Western Civil     1959
HD9502.C65    Commoner, Barr    The poverty of power: energy and the econo    1976
HC51.D6       Dobb, Maurice     Studies in the development of capitalism.     1947
HC103.F2      Fulkner, Haro     American economic history.                    1960
HB75.G23      Galbraith, Joh    The age of uncertainty.                       1977
HB75.G2       Galbraith, Joh    Money, whence it came, where it went.         1975
HC51.G6       Gould, John De    Economic growth in history: survey and anal   1972
--------------------------------------------------------------------------------
DISPLAY   DISPLAY   HOLD TO   PRINT          STEP    QUIT     HELP
FULL TI   COPIES    PRINT      ALL           BACK              !!!
```

EXAMPLE #16



```
1.  Michener, James A.     Centennial       Greenwich, Conn., 1974
2.  Michener, James A.     Centennial       New York, 1974
3.  Michener, James A.     Centennial       New York, 1974 DLC
4.  Michener, James A.     Centennial       London, 1975
6.  Michener, James A.     Centennial       Greenwich, Conn. 1975
        etc.
```

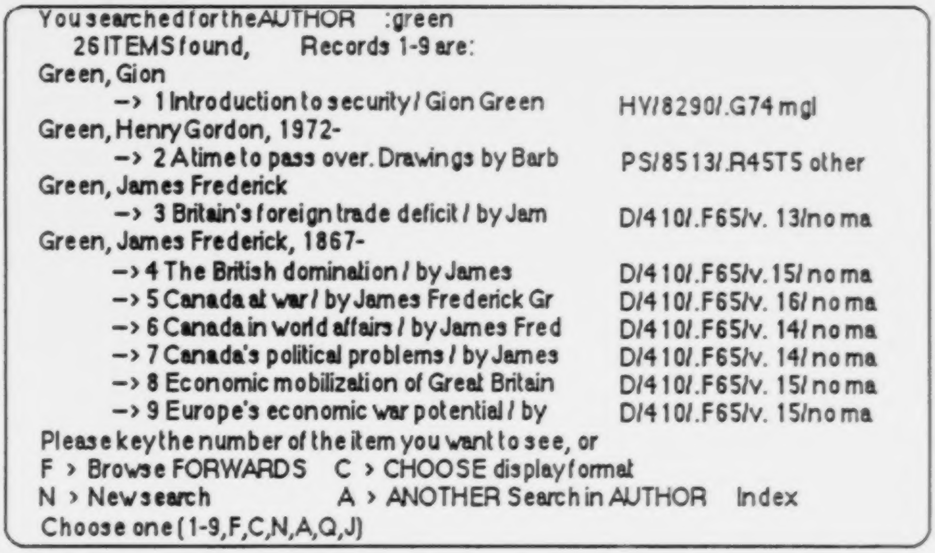
Example #17: We have a display that was an author search and shows titles associated. Notice that there are no labels on this display. They are displaying the works underneath each author. The numbers are line numbers. It's kind of neat the way they solve that particular problem.

Comment from the Audience: I'm a little troubled by the fact that this arrow prompt, which is typically a symbol to show the user where to type something, is used here as an indicator.

Matthews: That would be a perfect candidate for a guideline. We might advise designers not to do that because of the general usage of that character or that combination of characters as a prompt. Good observation.

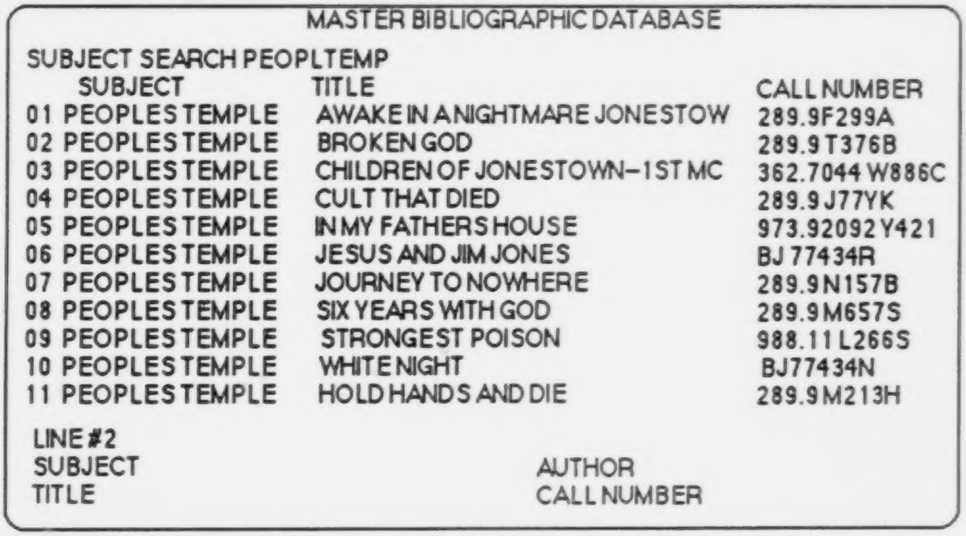
Example #18: We have some labels--SUBJECTS, TITLES, and CALL NUMBER, but all the data is in upper case only. Line numbers are not labeled.

EXAMPLE #17



```
You searched for the AUTHOR    :green
   26 ITEMS found,        Records 1-9 are:
Green, Gion
        -> 1 Introduction to security / Gion Green        HV/8290/.G74 mgl
Green, Henry Gordon, 1972-
        -> 2 A time to pass over. Drawings by Barb        PS/8513/.R45T5 other
Green, James Frederick
        -> 3 Britain's foreign trade deficit / by Jam      D/410/.F65/v. 13/noma
Green, James Frederick, 1867-
        -> 4 The British domination / by James            D/410/.F65/v. 15/noma
        -> 5 Canada at war / by James Frederick Gr        D/410/.F65/v. 16/noma
        -> 6 Canada in world affairs / by James Fred      D/410/.F65/v. 14/noma
        -> 7 Canada's political problems / by James       D/410/.F65/v. 14/noma
        -> 8 Economic mobilization of Great Britain       D/410/.F65/v. 15/noma
        -> 9 Europe's economic war potential / by         D/410/.F65/v. 15/noma
Please key the number of the item you want to see, or
F > Browse FORWARDS     C > CHOOSE display format
N > New search          A > ANOTHER Search in AUTHOR    Index
Choose one (1-9,F,C,N,A,Q,J)
```

EXAMPLE #18



```
                         MASTER BIBLIOGRAPHIC DATABASE

SUBJECT SEARCH PEOPLTEMP
    SUBJECT              TITLE                               CALL NUMBER
01 PEOPLES TEMPLE      AWAKE IN A NIGHTMARE JONESTOW       289.9F299A
02 PEOPLES TEMPLE      BROKEN GOD                          289.9T376B
03 PEOPLES TEMPLE      CHILDREN OF JONESTOWN-1ST MC        362.7044 W886C
04 PEOPLES TEMPLE      CULT THAT DIED                      289.9J77YK
05 PEOPLES TEMPLE      IN MY FATHERS HOUSE                 973.92092 Y421
06 PEOPLES TEMPLE      JESUS AND JIM JONES                 BJ 77434R
07 PEOPLES TEMPLE      JOURNEY TO NOWHERE                  289.9N157B
08 PEOPLES TEMPLE      SIX YEARS WITH GOD                  289.9M657S
09 PEOPLES TEMPLE       STRONGEST POISON                   988.11 L266S
10 PEOPLES TEMPLE      WHITE NIGHT                          BJ77434N
11 PEOPLES TEMPLE      HOLD HANDS AND DIE                  289.9M213H

 LINE #2
 SUBJECT                                     AUTHOR
 TITLE                                       CALL NUMBER
```

Example #19: We have some labels: AUTHOR, TITLE. Interestingly enough they tell the user that the display of the title is truncated. That's the first time I have seen that. We've got CALL # and OWN. OWN is the *code* for the name of "the library that owns." It's the location information. Again, the line number is not labeled, and again all the data is upper case.

Example #20: We've got LINE, TITLE, DATE, and LOCATION all labeled; that's nice. But the data is all upper case and that's not so nice.

Nielsen: You haven't commented about leading zeros.

Matthews: The research suggests that you should not use leading zeros. You should just number 1,2,3, and as the number gets to 14,15, it should expand; as it gets to 143 it expands again.

Hildreth: On the Claremont Total Library System the first record displayed is zero.

Matthews: Research suggests that when you start lists you need to start with the number 1.

Hildreth: In some systems, instead of digits you see letters of the alphabet to identify lines. They are usually shown in lower case, and in upper and lower case when you get over 26.

Logan: You haven't made any comments yet about punctuation--I see numbers with periods, numbers without periods....

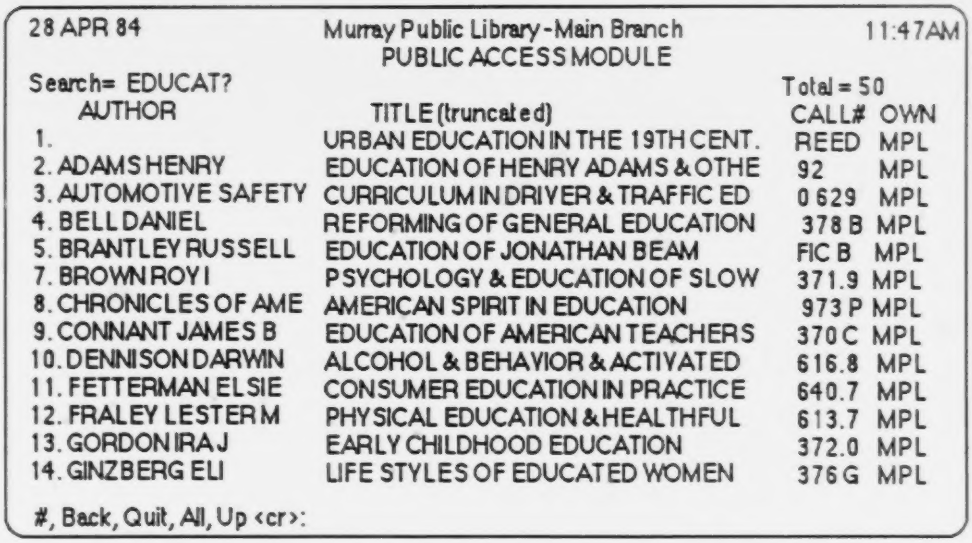
Matthews: In some systems we see brackets. The research suggests that there should be no punctuation.

Crawford: I want to go back to authorities for a moment. If you are supposed to start numbering sequences at 1 and you are also supposed to be able to browse backwards, what do you do for line numbers in that instance?

Matthews: One system uses negative numbers, but I didn't particularly like the way they went about showing them.

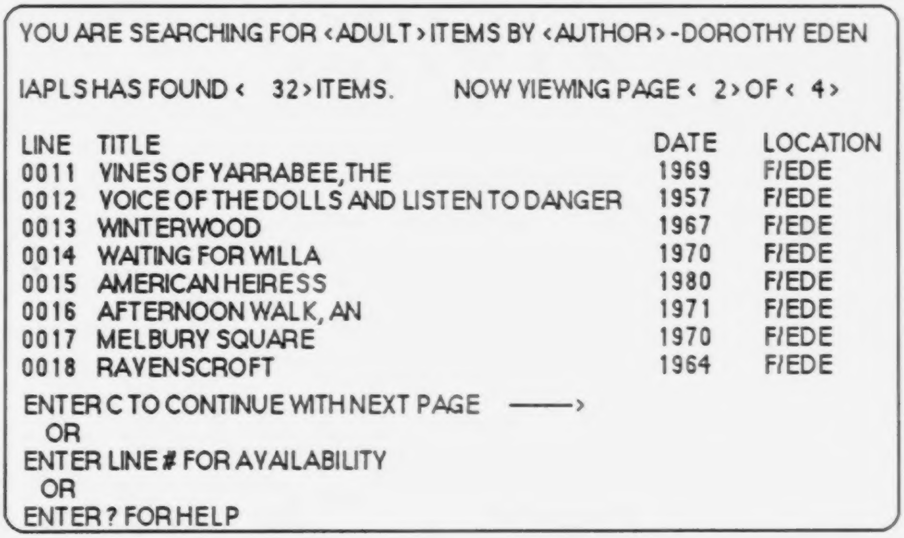
Crawford: It seems like that may be a case where single screen numbering might be justified. Or I guess you could number headings from the beginning of the index.

EXAMPLE #19



```
28 APR 84              Murray Public Library-Main Branch              11:47AM
                              PUBLIC ACCESS MODULE
Search= EDUCAT?                                                 Total = 50
     AUTHOR                   TITLE (truncated)                 CALL#  OWN
1.                       URBAN EDUCATION IN THE 19TH CENT.      REED   MPL
2. ADAMS HENRY           EDUCATION OF HENRY ADAMS & OTHE        92     MPL
3. AUTOMOTIVE SAFETY     CURRICULUM IN DRIVER & TRAFFIC ED      0629   MPL
4. BELL DANIEL           REFORMING OF GENERAL EDUCATION         378 B  MPL
5. BRANTLEY RUSSELL      EDUCATION OF JONATHAN BEAM             FIC B  MPL
7. BROWN ROY I           PSYCHOLOGY & EDUCATION OF SLOW         371.9  MPL
8. CHRONICLES OF AME     AMERICAN SPIRIT IN EDUCATION           973 P  MPL
9. CONNANT JAMES B       EDUCATION OF AMERICAN TEACHERS         370 C  MPL
10. DENNISON DARWIN      ALCOHOL & BEHAVIOR & ACTIVATED         616.8  MPL
11. FETTERMAN ELSIE      CONSUMER EDUCATION IN PRACTICE         640.7  MPL
12. FRALEY LESTER M      PHYSICAL EDUCATION & HEALTHFUL         613.7  MPL
13. GORDON IRA J         EARLY CHILDHOOD EDUCATION              372.0  MPL
14. GINZBERG ELI         LIFE STYLES OF EDUCATED WOMEN          376 G  MPL

#, Back, Quit, All, Up <cr>:
```

EXAMPLE #20



```
YOU ARE SEARCHING FOR <ADULT> ITEMS BY <AUTHOR> -DOROTHY EDEN

IAPLS HAS FOUND <   32> ITEMS.      NOW VIEWING PAGE <  2> OF <  4>

LINE  TITLE                                       DATE    LOCATION
0011  VINES OF YARRABEE,THE                       1969    F/EDE
0012  VOICE OF THE DOLLS AND LISTEN TO DANGER     1957    F/EDE
0013  WINTERWOOD                                  1967    F/EDE
0014  WAITING FOR WILLA                           1970    F/EDE
0015  AMERICAN HEIRESS                            1980    F/EDE
0016  AFTERNOON WALK, AN                          1971    F/EDE
0017  MELBURY SQUARE                              1970    F/EDE
0018  RAVENSCROFT                                 1964    F/EDE
ENTER C TO CONTINUE WITH NEXT PAGE   ——>
  OR
ENTER LINE # FOR AVAILABILITY
  OR
ENTER ? FOR HELP
```

Matthews: And wherever you get inserted into the index you start off with 14,379. That is going to be real helpful for the user.

Jones: Single screen numbering would work as long as you don't really scroll, but go backwards and forwards one screen at a time.

Hildreth: When there is no label on the data for line numbers, there often is punctuation: brackets, parens, or periods; somehow that is supposed to convey to the user that this piece of data is differentiated, that it is a special number.

Matthews: Maybe for most users that is enough; I don't know. It is not consistent with what the research suggests.

Example #21: Here we have a system that has line numbers, and not too much space between the author and the title. Then way over on the righthand side we get the number of documents that are referred to--not "references," not "citations," not "records," not "items"--now we have "documents."

Question: Is the information given for the author a floating or a fixed length column?

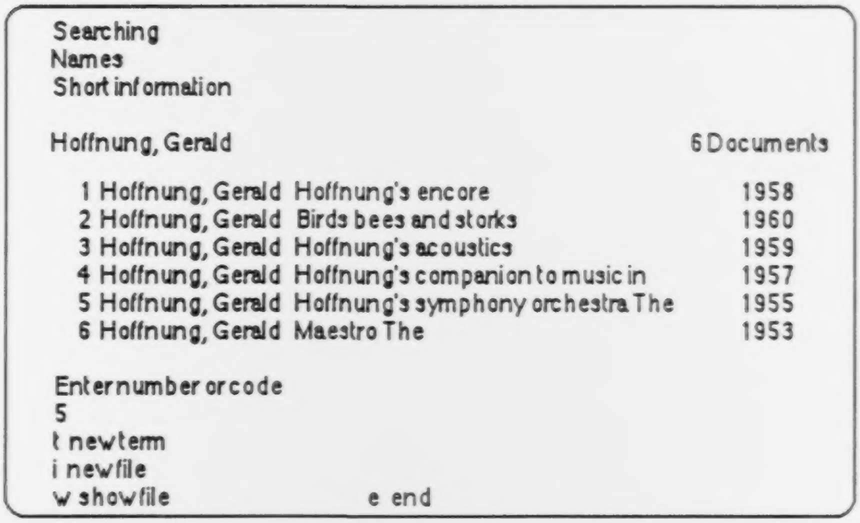
Matthews: I believe it is a fixed length column.

Borgman: Are we concerned here with sorting characters? On line 6, "Maestro The" is problematic.

Matthews: There is an implicit comma missing. There ought to be guidelines about using standard English sentences or titles, not "librarianese." Displays should focus on what users are going to see and not what data processing people or librarians are storing.

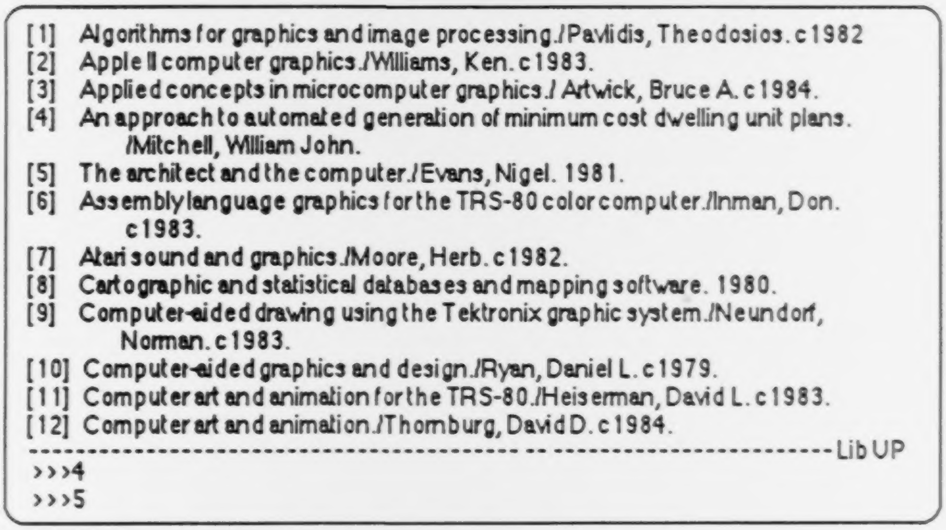
Example #22: We've got a whole bunch of text here. The line numbers are surrounded with brackets. There are no labels. They jam the data together and separate it with slashes. That's not such a hot thing to do. We get a sense of overall density.

EXAMPLE #21



```
Searching
Names
Short information

Hoffnung, Gerald                                        6 Documents

   1 Hoffnung, Gerald  Hoffnung's encore                        1958
   2 Hoffnung, Gerald  Birds bees and storks                    1960
   3 Hoffnung, Gerald  Hoffnung's acoustics                     1959
   4 Hoffnung, Gerald  Hoffnung's companion to music in         1957
   5 Hoffnung, Gerald  Hoffnung's symphony orchestra The        1955
   6 Hoffnung, Gerald  Maestro The                              1953

Enter number or code
5
t newterm
i newfile
w showfile                e end
```

EXAMPLE #22

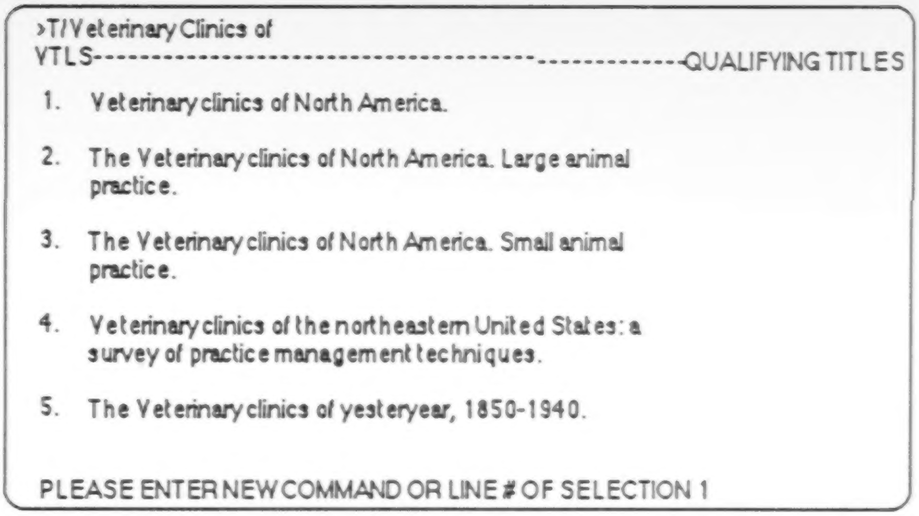


```
[1]  Algorithms for graphics and image processing./Pavlidis, Theodosios. c1982
[2]  Apple II computer graphics./Williams, Ken. c1983.
[3]  Applied concepts in microcomputer graphics./ Artwick, Bruce A. c1984.
[4]  An approach to automated generation of minimum cost dwelling unit plans.
        /Mitchell, William John.
[5]  The architect and the computer./Evans, Nigel. 1981.
[6]  Assembly language graphics for the TRS-80 color computer./Inman, Don.
        c1983.
[7]  Atari sound and graphics./Moore, Herb. c1982.
[8]  Cartographic and statistical databases and mapping software. 1980.
[9]  Computer-aided drawing using the Tektronix graphic system./Neundorf,
        Norman. c1983.
[10] Computer-aided graphics and design./Ryan, Daniel L. c1979.
[11] Computer art and animation for the TRS-80./Heiserman, David L. c1983.
[12] Computer art and animation./Thornburg, David D. c1984.
------------------------------------------ -- ------------------------Lib UP
>>>4
>>>5
```

Example #23: There are no labels for line numbers or titles. And for some reason they chop off their display fairly quickly.

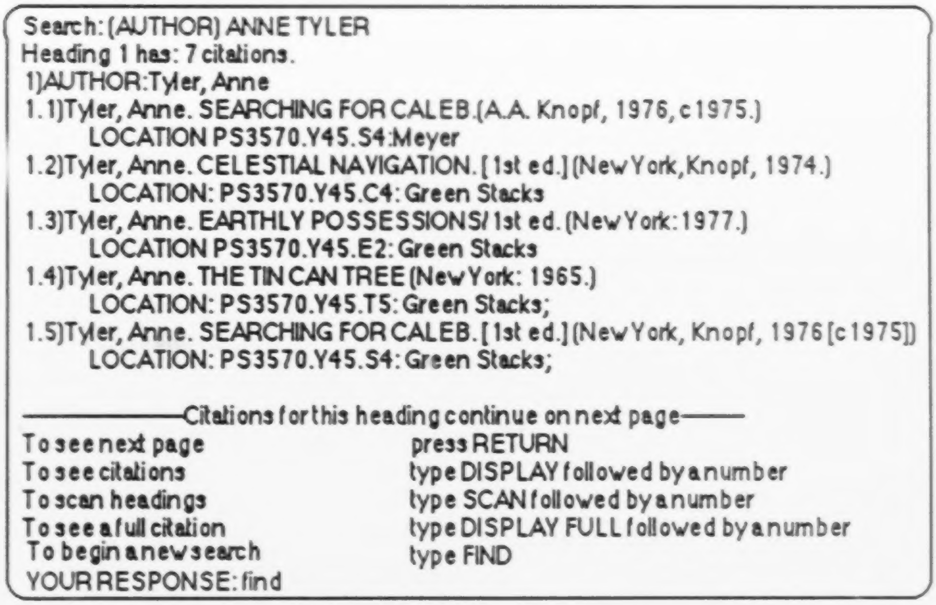
Example #24: We have up to two lines that are available for each record. We get an indication at the top that AUTHOR equals Tyler, Anne, and yet we see her name repeated every time. There are no labels. The title is put in all caps; some people here have suggested that may not be bad. According to the research it is not a good idea.

EXAMPLE #23



```
>T/Veterinary Clinics of
VTLS------------------------------------------------QUALIFYING TITLES
 1.   Veterinary clinics of North America.

 2.   The Veterinary clinics of North America. Large animal
      practice.

 3.   The Veterinary clinics of North America. Small animal
      practice.

 4.   Veterinary clinics of the northeastern United States: a
      survey of practice management techniques.

 5.   The Veterinary clinics of yesteryear, 1850-1940.


 PLEASE ENTER NEW COMMAND OR LINE # OF SELECTION 1
```

EXAMPLE #24



```
Search: (AUTHOR) ANNE TYLER
Heading 1 has: 7 citations.
1)AUTHOR:Tyler, Anne
1.1)Tyler, Anne. SEARCHING FOR CALEB.(A.A. Knopf, 1976, c1975.)
      LOCATION PS3570.Y45.S4:Meyer
1.2)Tyler, Anne. CELESTIAL NAVIGATION. [1st ed.] (New York,Knopf, 1974.)
      LOCATION: PS3570.Y45.C4: Green Stacks
1.3)Tyler, Anne. EARTHLY POSSESSIONS/ 1st ed. (New York: 1977.)
      LOCATION PS3570.Y45.E2: Green Stacks
1.4)Tyler, Anne. THE TIN CAN TREE (New York: 1965.)
      LOCATION: PS3570.Y45.T5: Green Stacks;
1.5)Tyler, Anne. SEARCHING FOR CALEB. [1st ed.] (New York, Knopf, 1976 [c1975])
      LOCATION: PS3570.Y45.S4: Green Stacks;

----------------Citations for this heading continue on next page------
To see next page              press RETURN
To see citations              type DISPLAY followed by a number
To scan headings              type SCAN followed by a number
To see a full citation        type DISPLAY FULL followed by a number
To begin a new search         type FIND
YOUR RESPONSE: find
```

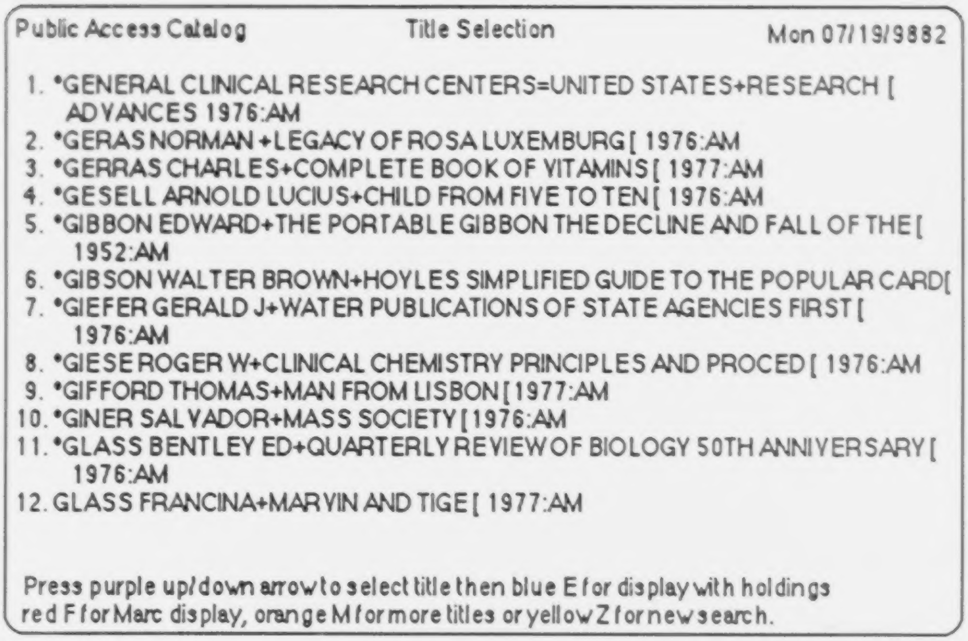
Example #25: We've got line numbers with punctuation but no labels. All the data is in upper case. AM is the code for the location in the library. Notice the "=" and "+" separating different data elements. That's not such a hot idea, either.

Question from the Audience: What are the square brackets at the end, for the date?

Matthews: Beats me.

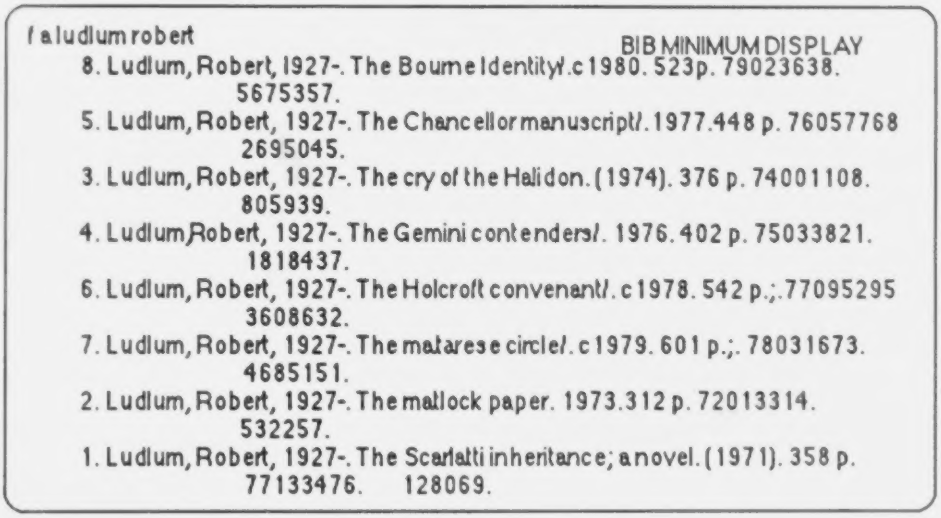
Example #26: We've got a display that seems to give line numbers in front of each record. They're not line numbers, are they? Or they may be line numbers. It's one of those WLN-type displays.

EXAMPLE #25



```
Public Access Catalog              Title Selection              Mon 07/19/9882

 1. *GENERAL CLINICAL RESEARCH CENTERS=UNITED STATES+RESEARCH [
     ADVANCES 1976:AM
 2. *GERAS NORMAN +LEGACY OF ROSA LUXEMBURG [ 1976:AM
 3. *GERRAS CHARLES+COMPLETE BOOK OF VITAMINS [ 1977:AM
 4. *GESELL ARNOLD LUCIUS+CHILD FROM FIVE TO TEN [ 1976:AM
 5. *GIBBON EDWARD+THE PORTABLE GIBBON THE DECLINE AND FALL OF THE [
     1952:AM
 6. *GIBSON WALTER BROWN+HOYLES SIMPLIFIED GUIDE TO THE POPULAR CARD[
 7. *GIEFER GERALD J+WATER PUBLICATIONS OF STATE AGENCIES FIRST [
     1976:AM
 8. *GIESE ROGER W+CLINICAL CHEMISTRY PRINCIPLES AND PROCED [ 1976:AM
 9. *GIFFORD THOMAS+MAN FROM LISBON [1977:AM
10. *GINER SALVADOR+MASS SOCIETY [1976:AM
11. *GLASS BENTLEY ED+QUARTERLY REVIEW OF BIOLOGY 50TH ANNIVERSARY [
     1976:AM
12. GLASS FRANCINA+MARVIN AND TIGE [ 1977:AM


 Press purple up/down arrow to select title then blue E for display with holdings
 red F for Marc display, orange M for more titles or yellow Z for new search.
```

EXAMPLE #26



```
f a ludlum robert
                                                    BIB MINIMUM DISPLAY
       8. Ludlum, Robert, 1927-. The Boume Identity/.c1980. 523p. 79023638.
                   5675357.
       5. Ludlum, Robert, 1927-. The Chancellor manuscript/. 1977. 448 p. 76057768
                   2695045.
       3. Ludlum, Robert, 1927-. The cry of the Halidon. (1974). 376 p. 74001108.
                   805939.
       4. Ludlum,Robert, 1927-. The Gemini contenders/. 1976. 402 p. 75033821.
                   1818437.
       6. Ludlum, Robert, 1927-. The Holcroft convenant/. c1978. 542 p.;.77095295
                   3608632.
       7. Ludlum, Robert, 1927-. The matarese circle/. c1979. 601 p.;. 78031673.
                   4685151.
       2. Ludlum, Robert, 1927-. The matlock paper. 1973. 312 p. 72013314.
                   532257.
       1. Ludlum, Robert, 1927-. The Scarlatti inheritance; a novel. (1971). 358 p.
                   77133476.     128069.
```

Example #27: We've got a very dense display. It's all upper case, no labels. There are line numbers. Things are jammed together. They also use only one bracket, instead of two, to separate data. They use an asterisk to separate the title from the author or the performer, whatever the case happens to be.

Question from the Audience: What's NU?

Nielsen: It's the source of cataloging.

Example #28: Remember we had B's before--now we have D's. There are no labels. The text is in upper and lower case, but separated by slashes.

Question from the Audience: What is SC, TA?

Matthews: I believe they're locations.

Salmon: It seems as if those slashes raise an interesting question about standardization. Catalogers went to International Standard Bibliographic Descriptions for the same reason we're talking about guidelines--so that users going from one catalog to another would see the same display.

Matthews: That's right, but on what format? Cards. Maybe we need to have a different set of guidelines for online catalogs. Later we'll see ADDED ENTRIES for additional authors. Well, for Pete's sake! We've only got one record in the online catalog, folks--why not put "added entries" up here where the rest of the authors are--group all those suckers together?

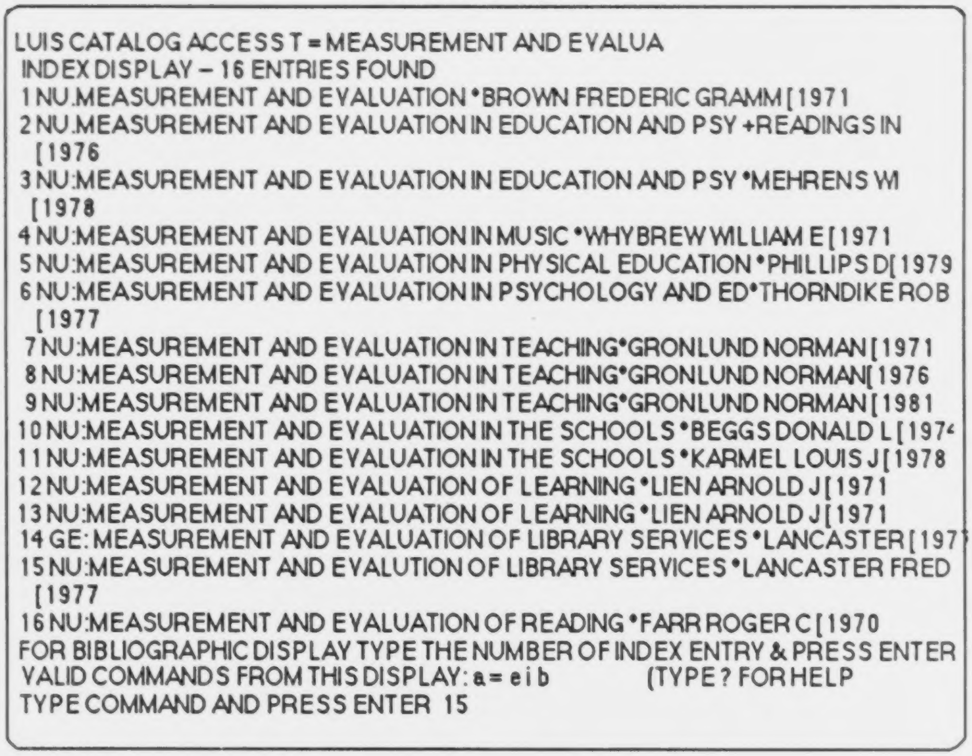
Hildreth: One of the reasons ISBD punctuation and standard indentation are used is so readers of other languages would still be able to differentiate titles, authors, etc.

Potter: ISBD was also set up for optical character recognition.

Matthews: But you won't scan a screen!

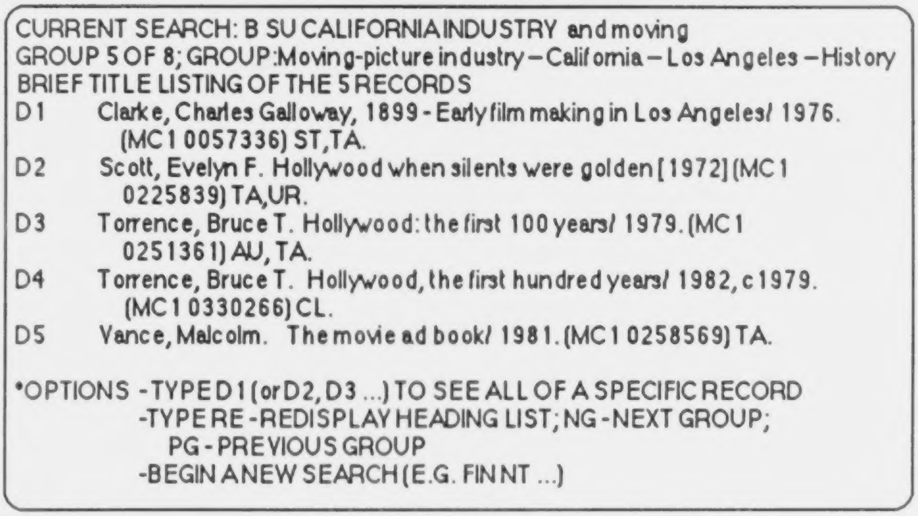
Crawford: What you have on this screen is not standard ISBD punctuation anyway--the spaces are stripped out and the element that follows the slash isn't there.

EXAMPLE #27



```
LUIS CATALOG ACCESS T = MEASUREMENT AND EVALUA
 INDEX DISPLAY - 16 ENTRIES FOUND
 1 NU:MEASUREMENT AND EVALUATION *BROWN FREDERIC GRAMM [1971
 2 NU:MEASUREMENT AND EVALUATION IN EDUCATION AND PSY +READINGS IN
   [1976
 3 NU:MEASUREMENT AND EVALUATION IN EDUCATION AND PSY *MEHRENS WI
   [1978
 4 NU:MEASUREMENT AND EVALUATION IN MUSIC *WHYBREW WILLIAM E [1971
 5 NU:MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION *PHILLIPS D[1979
 6 NU:MEASUREMENT AND EVALUATION IN PSYCHOLOGY AND ED*THORNDIKE ROB
   [1977
 7 NU:MEASUREMENT AND EVALUATION IN TEACHING*GRONLUND NORMAN [1971
 8 NU:MEASUREMENT AND EVALUATION IN TEACHING*GRONLUND NORMAN[1976
 9 NU:MEASUREMENT AND EVALUATION IN TEACHING*GRONLUND NORMAN [1981
10 NU:MEASUREMENT AND EVALUATION IN THE SCHOOLS *BEGGS DONALD L [197
11 NU:MEASUREMENT AND EVALUATION IN THE SCHOOLS *KARMEL LOUIS J [1978
12 NU:MEASUREMENT AND EVALUATION OF LEARNING *LIEN ARNOLD J [1971
13 NU:MEASUREMENT AND EVALUATION OF LEARNING *LIEN ARNOLD J [1971
14 GE: MEASUREMENT AND EVALUATION OF LIBRARY SERVICES *LANCASTER [197
15 NU:MEASUREMENT AND EVALUTION OF LIBRARY SERVICES *LANCASTER FRED
   [1977
16 NU:MEASUREMENT AND EVALUATION OF READING *FARR ROGER C [1970
FOR BIBLIOGRAPHIC DISPLAY TYPE THE NUMBER OF INDEX ENTRY & PRESS ENTER
VALID COMMANDS FROM THIS DISPLAY: a = e i b          (TYPE ? FOR HELP
TYPE COMMAND AND PRESS ENTER  15
```

EXAMPLE #28

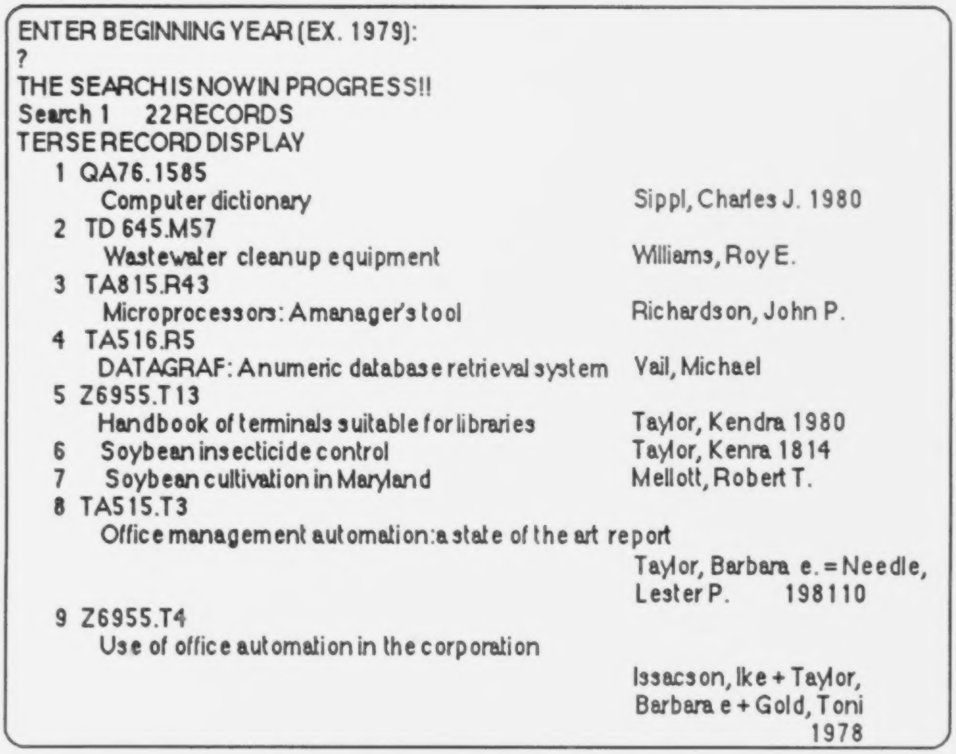


```
CURRENT SEARCH: B SU CALIFORNIA INDUSTRY and moving
GROUP 5 OF 8; GROUP:Moving-picture industry - California - Los Angeles - History
BRIEF TITLE LISTING OF THE 5 RECORDS
D1      Clarke, Charles Galloway, 1899 - Early film making in Los Angeles/ 1976.
          (MC 1 0057336) ST,TA.
D2      Scott, Evelyn F. Hollywood when silents were golden [1972] (MC 1
          0225839) TA,UR.
D3      Torrence, Bruce T. Hollywood: the first 100 years/ 1979. (MC 1
          0251361) AU, TA.
D4      Torrence, Bruce T. Hollywood, the first hundred years/ 1982, c1979.
          (MC 1 0330266) CL.
D5      Vance, Malcolm. The movie ad book/ 1981. (MC 1 0258569) TA.

*OPTIONS -TYPE D1 (or D2, D3 ...) TO SEE ALL OF A SPECIFIC RECORD
         -TYPE RE -REDISPLAY HEADING LIST; NG -NEXT GROUP;
            PG - PREVIOUS GROUP
         -BEGIN A NEW SEARCH (E.G. FIN NT ...)
```

Example #29: Here we've got a system with no punctuation around the line number, and no labels. They start off with a call number--like cards do. It is really interesting how we carry the baggage of tradition in other formats into a new medium without thinking about it.

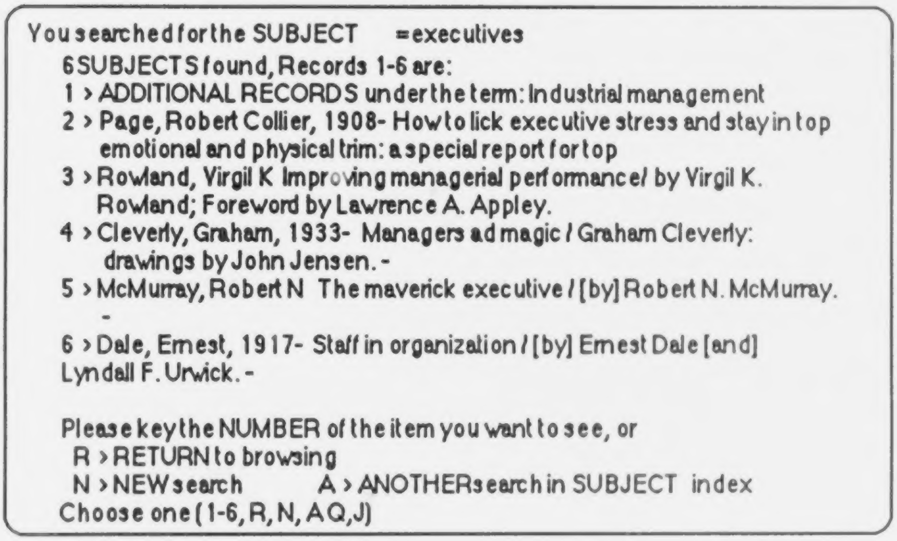
Example #30: We have separators for each of the records, which are somewhat similar to the cursors that have been used in other systems--the little arrows. Again we have no labels, and we have fields separated by slashes.

EXAMPLE #29



```
ENTER BEGINNING YEAR (EX. 1979):
?
THE SEARCH IS NOW IN PROGRESS!!
Search 1     22 RECORDS
TERSE RECORD DISPLAY
    1 QA76.1585
        Computer dictionary                          Sippl, Charles J. 1980
    2 TD 645.M57
        Wastewater cleanup equipment                 Williams, Roy E.
    3 TA815.R43
        Microprocessors: A manager's tool            Richardson, John P.
    4 TA516.R5
        DATAGRAF: A numeric database retrieval system Vail, Michael
    5 Z6955.T13
        Handbook of terminals suitable for libraries Taylor, Kendra 1980
    6   Soybean insecticide control                  Taylor, Kenra 1814
    7   Soybean cultivation in Maryland              Mellott, Robert T.
    8 TA515.T3
        Office management automation: a state of the art report
                                                     Taylor, Barbara e. = Needle,
                                                     Lester P.       198110
    9 Z6955.T4
        Use of office automation in the corporation
                                                     Issacson, Ike + Taylor,
                                                     Barbara e + Gold, Toni
                                                                   1978
```

EXAMPLE #30



```
You searched for the SUBJECT      = executives
    6 SUBJECTS found, Records 1-6 are:
    1 > ADDITIONAL RECORDS under the term: Industrial management
    2 > Page, Robert Collier, 1908- How to lick executive stress and stay in top
          emotional and physical trim: a special report for top
    3 > Rowland, Virgil K Improving managerial performance / by Virgil K.
          Rowland; Foreword by Lawrence A. Appley.
    4 > Cleverly, Graham, 1933-  Managers ad magic / Graham Cleverly:
          drawings by John Jensen. -
    5 > McMurray, Robert N  The maverick executive / [by] Robert N. McMurray.
          -
    6 > Dale, Ernest, 1917- Staff in organization / [by] Ernest Dale [and]
    Lyndall F. Urwick. -

    Please key the NUMBER of the item you want to see, or
      R > RETURN to browsing
      N > NEW search          A > ANOTHER search in SUBJECT  index
    Choose one (1-6, R, N, AQ,J)
```

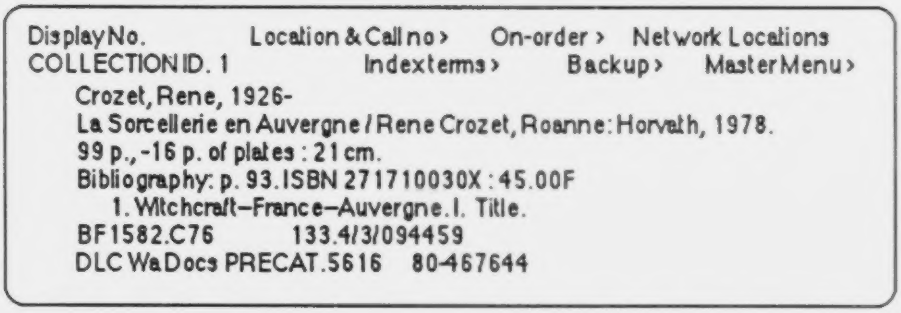
The next group of records that we are going to look at are brief displays.

Example #31: This looks like a 3x5 card. Why is it, do you suppose, that they are displaying the ISBN number for a brief bibliographic record?

Example #32: The next one is a labeled format. The labels are left justified with colons. We have text in upper and lower case. Again we have slashes at the end of the title. We've got the wonderful descriptor IMPRINT as a label. Then we've got some other labels in upper and lower case. "Location," "Call Number," "Cpy#" and "Status" are not separated in any way from the variable text. Why use an abbreviation for saving one character--C-P-Y?

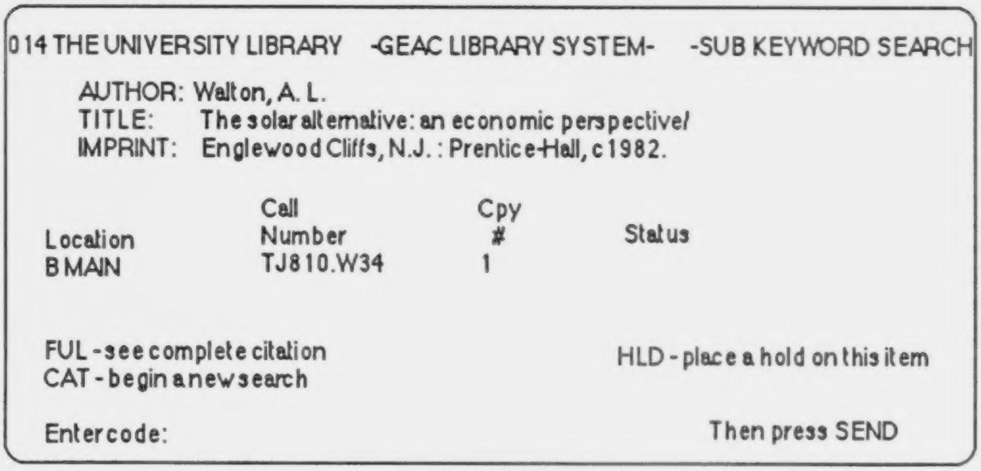
Example #33: Things kind of run on here. This record includes just what the user always needed to know--the LC call number. There are no labels, but we definitely do need centimeters, right?

EXAMPLE #31



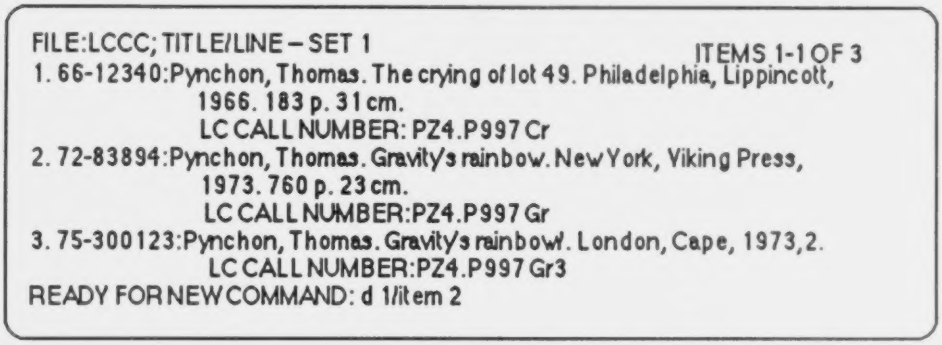
```
DisplayNo.          Location &Callno >   On-order >   Network Locations
COLLECTIONID. 1              Indexterms >       Backup >    MasterMenu >
     Crozet, Rene, 1926-
     La Sorcellerie en Auvergne / Rene Crozet, Roanne: Horvath, 1978.
     99 p., -16 p. of plates : 21 cm.
     Bibliography: p. 93. ISBN 271710030X : 45.00F
        1. Witchcraft–France–Auvergne. I. Title.
     BF1582.C76          133.4/3/094459
     DLC WaDocs PRECAT.5616     80-467644
```

EXAMPLE # 32



```
014 THE UNIVERSITY LIBRARY    -GEAC LIBRARY SYSTEM-     -SUB KEYWORD SEARCH

      AUTHOR:  Walton, A. L.
      TITLE:     The solar alternative: an economic perspective/
      IMPRINT:   Englewood Cliffs, N.J. : Prentice-Hall, c1982.

                        Call              Cpy
   Location             Number             #            Status
   B MAIN               TJ810.W34          1


   FUL - see complete citation                   HLD - place a hold on this item
   CAT - begin a new search

   Entercode:                                          Then press SEND
```

EXAMPLE #33



```
FILE:LCCC; TITLE/LINE – SET 1                          ITEMS 1-1 OF 3
1. 66-12340:Pynchon, Thomas. The crying of lot 49. Philadelphia, Lippincott,
                   1966. 183 p. 31 cm.
                   LC CALL NUMBER: PZ4.P997 Cr
2. 72-83894:Pynchon, Thomas. Gravity's rainbow. New York, Viking Press,
                   1973. 760 p. 23 cm.
                   LC CALL NUMBER:PZ4.P997 Gr
3. 75-300123:Pynchon, Thomas. Gravity's rainbow/. London, Cape, 1973,2.
                    LC CALL NUMBER:PZ4.P997 Gr3
READY FOR NEW COMMAND: d 1/item 2
```

Example #34: We've got some labels. We've got some WU numbers. A WU number must be a call number, but I am not sure. Then we have some authors. Notice that the separator is an equal sign. Here they did put all the authors together. They did use all cap labels. This is an example of the labels' being right justified. And why repeat the author statement again in the title display? They have some really wonderful locations there, right? We see CD LOC.

Borgman: I'm interested in how they've used white space. Is it a better balance to use big blocks of white space and scrunch the text together this way, or to spread out the text more in a longer line?

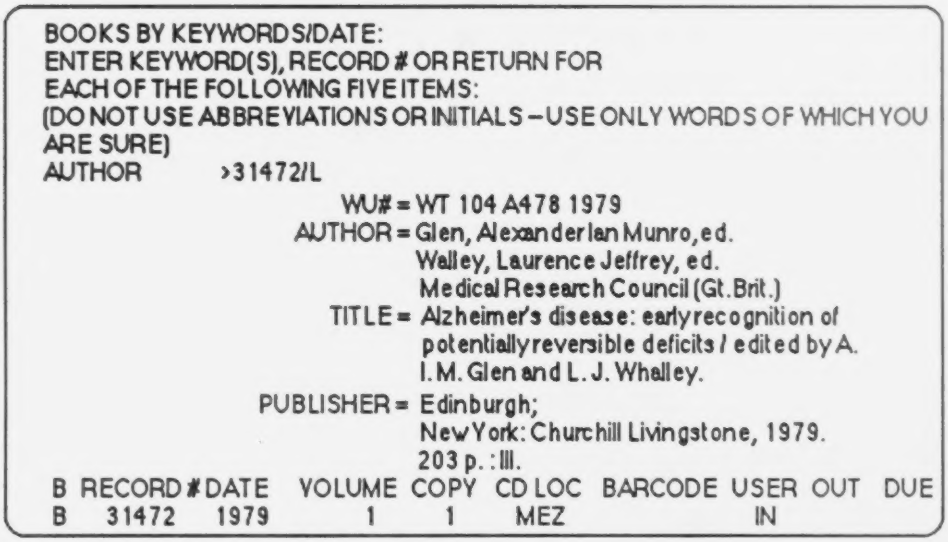
Matthews: The research is unclear at this point on that issue. If you get too much white space between the text and a number, like on that authority display we saw earlier, then I think that is counterproductive. In this case, I think they squished too much in the middle and they have too much white space on the outside. That's my opinion, but the research at present is unclear as to what the real guideline should be.

Example #35: Notice they abbreviated "author" for that label. They also abbreviated "imprint"--notice how much space we have. Why cut down just to leave blanks? We've got PDATE. Well, I won't go into that. An online catalog in California for a while had "call number" abbreviated CAL, and everybody thought that was a California unique ID number until they changed their abbreviation. Selection of abbreviations is really important.

Comment from the Audience: What you call a brief record, some of us call it "interim;" in other places it's called "terse."

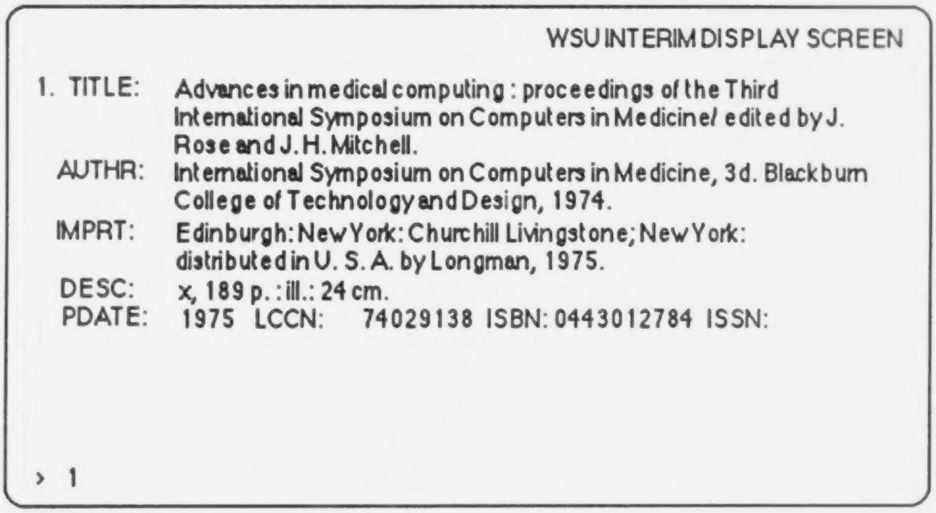
Matthews: That's correct. In his book Charles Hildreth identified 9 or 10 names for the same screen, across systems. That's why we need to come up with a glossary of what to call these various things, so that we, users, librarians, and system designers can talk intelligently about them.

EXAMPLE #34



```
BOOKS BY KEYWORDS/DATE:
ENTER KEYWORD(S), RECORD # OR RETURN FOR
EACH OF THE FOLLOWING FIVE ITEMS:
(DO NOT USE ABBREVIATIONS OR INITIALS - USE ONLY WORDS OF WHICH YOU
ARE SURE)
AUTHOR          >31472/L
                              WU# = WT 104 A478 1979
                          AUTHOR = Glen, Alexander Ian Munro, ed.
                                   Walley, Laurence Jeffrey, ed.
                                   Medical Research Council (Gt.Brit.)
                            TITLE = Alzheimer's disease: early recognition of
                                   potentially reversible deficits / edited by A.
                                   I. M. Glen and L. J. Whalley.
                       PUBLISHER = Edinburgh;
                                   New York: Churchill Livingstone, 1979.
                                   203 p. : Ill.
 B  RECORD # DATE   VOLUME  COPY  CD LOC   BARCODE  USER  OUT   DUE
 B    31472  1979       1      1    MEZ               IN
```

EXAMPLE # 35



```
                                          WSU INTERIM DISPLAY SCREEN

 1. TITLE:   Advances in medical computing : proceedings of the Third
             International Symposium on Computers in Medicine/ edited by J.
             Rose and J. H. Mitchell.
   AUTHR:    International Symposium on Computers in Medicine, 3d. Blackburn
             College of Technology and Design, 1974.
   IMPRT:    Edinburgh: New York: Churchill Livingstone; New York:
             distributed in U. S. A. by Longman, 1975.
   DESC:     x, 189 p. : ill.: 24 cm.
   PDATE:    1975  LCCN:    74029138  ISBN: 0443012784  ISSN:




 > 1
```

Hildreth: I really enjoy outtakes from movies. These screens are just the online catalog outtakes, right?

Matthews: Well, unfortunately folks, this is the real stuff.

Let's turn to the full displays.

Example #36: There is the be all and the end all when it comes to wonderful displays. Lots of white space, lots of user friendliness.

Hildreth: But Joe, it has labels! The pound sign means "subject."

Jones: Lots of these nit-picky things we've focused on--like the height of a book in a brief display--are the small (maybe Pyrrhic) victories of individual catalogers. There are a few victories of programmers in there as well. My final remark relates to the nature of guidelines. Just remember that guidelines are ranges of acceptable options. They are not prescriptive rules. A range of acceptable options--that's what we have in our sights at the moment.

EXAMPLE # 36

```
WW
HYMAN BLUMBERG SYMPOSIUM ON RESEARCH IN EARLY CHILDHOOD EDUCA-
TION/WOMEN AND
THE MATHEMATICAL MYSTIQUE: PROCEEDINGS OF THE 8TH ANNUAL HYMAN
BLUMBERG SYMPOSIUM ON RESEARCH IN EARLY CHILDHOOD EDUCATION/
EDITED BY LYNN H. FOX, LINDA BRODY, AND DIANNE TOBIN./BALTIMORE: JOHNS
HOPKINS UNIVERSITY PRESS, C1980./VIII, 211 P. :ILL. : 24 CM./(STUDIES OF
INTELLECTUAL PRECOCITY:8) #SEX DIFFERENCES IN EDUCATION - CONGRESSES.
/#MATHEMATICS - STUDY AND TEACHING - CONGRESSES./& FOX LYNN H., 1944-
CN/& BRODY, LINDA CN/& TOBIN, DIANNE, CN/&
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. CN/(111)/MAN
BLUMBERG SYMPOSIUM ON RESEARCH IN EARLY CHILDHOOD EDUCATION. 8TH,
JOHNS HOPKINS UNIVERSITY, 1976.
```

III. DISPLAYS IN DATABASE SEARCH SYSTEMS

Fran Spigai

"Can the behavioral characteristics inherent in searchers be correlated with interactive display techniques to give meaning to 'ease of use'? Do searcher differences tend to overshadow searcher commonalities? Can we afford to design for the perhaps non-existent average man? Must our image of the user fundamentally incorporate ranges? What effect does this have on interface design? In light of the probabilistic nature of search performance would we recognize an optimal user facility interface even if we had achieved it? What sort of data could we collect to indicate optimality? Have we had enough experience to be able to design an interface for use by the general public? Can we with any confidence say that we know enough about the user population so that we now know what should be provided and how to provide it? What can we plan to do now to gain this kind of information? And finally, does the general public misconception of the computer as a 'magic brain' set an expectation for a quality of computer response which search facility designers cannot presently meet? Should this color the design of the interface?"

There are at least another twenty-five challenging questions presented in a paper written by John Bennett almost 15 years ago, for a workshop on "The User Interface for Interactive Searching of Bibliographic Databases."[1] This workshop gathered together about forty prominent designers, not of online public access catalogs, but of the online bibliographic utilities that I am going to be talking about today. Results of that meeting probably spurred them on to making better systems; we're here for the same reason.

I'd like to concentrate on the historical development of the various factors that make up bibliographic displays. Displays are not simply records, not just authority lists or indexes or the different parts of the inverted index. The concept of display also incorporates the retrieval language, scope notes, and even the audience/users for whom the system was developed. Figure 1 presents some display factors that complement Joe Matthews' "guidelines."

Figure 1

DISPLAY FACTORS

MATTHEWS (Aspects)	SPIGAI (Retrieval Systems Components)
Layout	Retrieval Language
Content/Sequence	Bibliographic Records
Vocabulary	Index Pointers
Typography	Scope Notes --structure/size --changes
Spacing	Audience/Users
Punctuation	
Color	

Bibliographic utilities have gone through just about every kind of retrieval language--from commands to menus to prompts, questions and answers and special "helps." Over the years the records themselves have carried a variety of labels for their various roles. The sequences in which records are output have also varied considerably. "Online literature searching, viewed objectively, has become a complex process. By early 1982 several dozen online services around the world offered more than 200 bibliographic databases, containing perhaps 75 million references to the literature of the past five to twenty years. While there are ten to twenty common access points such as author, title words, and journal names, there are hundreds of access points unique to individual databases and to small families of databases. Databases vary widely in terms of which titles are indexed, in terms of the numbers of titles indexed and numbers of searchable records. Every controlled vocabulary uses quite different terminology from others, even among databases covering the same discipline."[2]

Further, as databases age there are often changes--usually additions to scope. This can result in an increase in the number of sources and the number of access points, sometimes increasing the record size. And of course the total number of records for that database swells, as does the number of records added per update. As a result of these two events, a two-dimensional problem arises for the online searcher. He or she must make a series of choices with respect to scope and to time. First, the number of options to choose from--for example, which database, which access points, which subject terms--is well beyond the capability of average human memory. Second, the answer to any given search question is dynamic with respect to the composition of content over time. However, the causes of these dynamic changes are not explicitly visible via the online system or the resulting records. These are two aspects of most online systems that are not being approached by any of the services, including the online public access catalogs.

Several years ago, Dave Penniman, Howard Turtle and Thomas Hickey did a review of the literature of data entry and display devices for interactive retrieval.[3] They defined "display devices" as belonging to one of two general categories--hard copy and transient image. Though most of the systems here use CRT displays, that's not the case with the bibliographic utilities, which have always relied on hard copy output.

Figure 2 gives a feeling for how complex searching really is. This shows the different levels within the users' decision-making process. First they have to know the service, then they have to know the database. They have to have some feel for the scope of that service and the scope of that database. They have to know what the record contains, how many fields there are, the scope of each field, and the definition for each field. Are there sub-fields? What is the definition for each sub-field? You get some feeling for how hard it is to get to helpful output.

Figure 3 shows the record format. One record from Management Contents exists in three different forms on three services. The top one is BRS, the second is Dialog and the third is Orbit. In terms of sequence and labels they are all quite different. Though we are trying to make displays simple (and I think that's an admirable goal), we have to keep in mind how complicated these systems really are.

I'd like to give a very brief overview of where we are right now in the development of online bibliographic reference services. There are about 30 vendors that give widespread international access to bibliographic reference material. In this country and in Canada there are about ten. In Europe, which makes up most of the rest of the market, there are approximately twenty. There are, in turn, about 300 different files (databases). Some of these databases are broken up by year; for example, INSPEC (for electronic information) is broken up by different vendors according to the number of years that can be managed in one file. So about 300 files represent more than 200 unique publications.

There are actually about 350 different online vendors, but most of them don't provide access to bibliographic databases. BRS or Dialog is the type of service that would constitute what I consider a bibliographic vendor. Likewise, bibliographic databases are limited to files that refer to published literature of some kind, as opposed to Dow Jones stock quotes or other kinds of online databases that I would not consider part of the bibliographic group. (However, some vendors such as Dow Jones do also offer bibliographic services.)

Figure 2

LEVELS OF COMPLEXITY

		EXAMPLES	COMPONENTS
1.	**Online Services**	DIALOG	125 Databases
2.	**Database**	MANAGEMENT CONTENTS	100K Records
3.	**Record**	Record #173313	11 Fields
4.	**Field**	Descriptors BANK ... CEO	4 Sub-Fields
5.	**Sub-Field**	One Descriptor BANKS & BANKING	3 Words
6.	**Word**	BANKING	7 Characters

Figure 3

BIBLIOGRAPHICAL RETRIEVAL SERVICES

```
AN BZE80E0075.
AU MILLER, R.B..
TI NEW SPIRIT AT AMERICAN INDIAN NATIONAL BANK.
SO BANKERS MAGAZINE, VOL.163, NO. 3, MAY-JUNE 1980, P. 75-76.
CD BZE..
YR 80..
DE BANK; BANKS-AND-BANKING; CHARTER; CHIEF-EXECUTIVE-OFFICER.
AB CHARTERED IN 1973, THE AMERICAN INDIAN NATIONAL BANK WAS INSTITUTED
   TO SERVE INDIAN TRIBES FINANCIALLY.  PROBLEMS ENCOUNTERED INITIALLY
   WERE A LACK OF INDIAN STOCK PURCHASERS AND LITTLE BANKING EXPERIENCE
   AMONG THE PERSONNEL.  A NEW NON-INDIAN CHIEF EXECUTIVE OFFICER HAS
   TURNED THE BANK'S PROFITS AND HAS GIVEN THE BANK NEW HOPE OF SUCCESS.
PT JOURNAL.
PN AMERICAN INDIAN NATIONAL BANK.
```

Lockheed DIALOG

```
173313    BZE80E0075
   NEW SPIRIT AT AMERICAN INDIAN NATIONAL BANK.
  MILLER, R.B.
  BANKERS MAGAZINE, VOL.163, NO.3, MAY-JUNE 1980, P. 75-76., JOURNAL.
  CHARTERED IN 1973,  THE AMERICAN INDIAN NATIONAL BANK WAS INSTITUTED TO
  SERVE INDIAN TRIBES FINANCIALLY.  PROBLEMS ENCOUNTERED INITIALLY WERE A
  LACK OF INDIAN STOCK PURCHASERS AND LITTLE BANKING EXPERIENCE AMONG THE
  PERSONNEL.  A NEW NON-INDIAN CHIEF EXECUTIVE OFFICER HAS TURNED THE
  BANK'S PROFITS AND HAS GIVEN THE BANK NEW HOPE OF SUCCESS..
  Descriptors: BANK; BANKS AND BANKING; CHARTER; CHIEF EXECUTIVE OFFICER;
  0001; 0001; 0965
-------------------------------------------------------------------------
```

Figure 3 - continued

System Development Corp. ORBIT

```
AN  - BZE80E0075
TI  - NEW SPIRIT AT AMERICAN INDIAN NATIONAL BANK.
AU  - MILLER, R.B.
SO  - BANKERS MAGAZINE, VOL. 163, NO.3, MAY-JUNE 1980, P. 75-76.
CC  - 0001; 0001; 0965
IT  - BANK; BANKS AND BANKING; CHARTER; CHIEF EXECUTIVE OFFICER
ST  - AMERICAN INDIAN NATIONAL BANK
DT  - JOURNAL
AB  - CHARTERED IN 1973, THE AMERICAN INDIAN NATIONAL BANK WAS
      INSTITUTED TO SERVE INDIAN TRIBES FINANCIALLY.  PROBLEMS
      ENCOUNTERED INITIALLY WERE A LACK OF INDIAN STOCK PURCHASERS AND
      LITTLE BANKING EXPERIENCE AMONG THE PERSONNEL.  A NEW NON-INDIAN
      CHIEF EXECUTIVE OFFICER HAS TURNED THE BANK'S PROFITS AND HAS
      GIVEN THE BANK NEW HOPE OF SUCCESS.
```

Question from the Audience: What about OCLC or RLIN?

Spigai: In this case I haven't included them, but have limited my comments to commercial services that are geared from the beginning to the for-profit marketplace. My definition, which is fairly narrow, is restricted to conventional reference services that deal primarily with journal or non-book catalog citations.

One of the things that has determined the growth (or non-growth) of services for the end user is that it is not clear that there is a paying end user market (and paying is the operative word) for bibliographic databases. Dow Jones has more than 200,000 users, but these users are not trying to get to the bibliographic databases; they are using the system to get to very time-sensitive (greed-oriented) databases that deal with stocks, financial data for public companies, and things like that.

As I walked around the room yesterday I was impressed with how far online catalogs have come. But a question came to mind. Will online catalogs be free? If yes, then even poor systems will succeed. But if no, then even the best designs will come under scrutiny and all the designs will change. The question of how much we should refine the displays of online public access catalogs has to be considered in terms of the money that can be spent on them. If the money question isn't predominant in your mind today, somewhere down the line there is going to have to be a lot of redesign.

Back to the history of how reference utilities have developed: Let me go over a few points that characterize system design for the first ten years, from the mid-sixties through the mid-seventies. To illustrate these points I will compare the reference utilities and the cataloging utilities (see Figure 4). Different technologies and economies shaped their development. (I am using OCLC as the example of cataloging services and Dialog as the example of commercial reference services because each has the biggest share of the library market for those services.)

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Figure 4

REQUIREMENTS INFLUENCING EARLY DESIGN CHARACTERISTICS OF ONLINE SERVICES FOR LIBRARIANS

The First Ten Years (Mid '60's - Mid '70's)

	Cataloging utilities (e.g. OCLC)	Reference utilities (e.g. DIALOG)
Designed for	Librarian	End user w. Librarian as Intermediary
Product	Catalog entry and/or Record and/or Card and/or Database being Created	Bibliography Being Compiled
Time Sensitivity For Use of Product	Small	Small --- Large Public/Academic Research/Govt./ Corporate
Price Formula	(a) Equipment (b) Leased Lines (c) FTUs (d) Print Records (Offline)	(a) Connect Time (b) Telecommunications (c) Local Telephone Charges (d) Print Records (Offline)
Frequency of Use	As a Workstation -- Significant Part of a Day (Predictable)	Intermittent, On-Demand (Not Always Predictable) Few Minuest a Day
Services Used	Only One	Two or More
Databases Used	Few	Dozens
Information	Derivative From Books with Specific Rules (e.g. OCLC Later AACR2) For Entry	Derivative From Journals, Reports, etc. Many "Standards" and Conventions (MEDLINE, ERIC, NTIS, etc.) Also In-Print and/or Microform Often Determined Content (Indexes, etc.) In Early Years

Comment from the Audience: OCLC was designed for the cataloger. By contrast, the reference utilities were designed for the end user--for people at NASA, or at NLM. Only later was there a great deal of design for the librarian, and that librarian was primarily an intermediary.

Product

In terms of product, the services are very different. The reference utility product is a bibliography; therefore, hard copy is essential. With the cataloging utility, the product can be a catalog entry, or record, or card, or the database that is being created.

Time Sensitivity

The time sensitivity for the use of the two products is somewhat different as well. By and large, the need for truly time-sensitive products from any system that deals with bibliographic data is relatively small. Time sensitivity for products--such as catalog cards--from the cataloging utilities is minimal. For the bibliography that's being compiled on a reference utility, time sensitivity ranges anywhere from low for some public libraries up to very critical time sensitivity for some research, government, and corporate libraries.

Price

The price formulas are also very different. Cataloging utilities' pricing tended to be along a subscription line or a full package line. Equipment, leased lines, First Time Use charge (FTU) or other similar charges, and charges for printing records offline were some of the components of the first price formulas that were used by the cataloging utilities.

Reference utilities, on the other hand, billed according to connect time. There are two additional aspects of connect time: the charge for the time you're connected to the telecommunications service (as opposed to the actual reference service) and the charge for the time you're connected to your local Bell Operating company. And finally, there was a charge for offline print records. Today, this has changed considerably; 70 percent of publishers now also have online print charges. Initially that was not the case. Users were rewarded for quick searches on the reference utilities since pricing was connect time dependent. On the other hand, there weren't necessarily cost-saving rewards for fast entry on the cataloging utilities.

Custom vs. Generic Displays

With the use of leased lines, higher transmission speeds were possible with the cataloging utilities. Therefore, custom screens made a lot of sense.

The reference utilities, on the other hand, had to support all kinds of ASCII terminals, almost from the beginning. Only in a few early cases were CRTs in general use in libraries. And nothing was standard with hard copy. Designers had to deal with line-at-a-time situations instead of screens full of data. Mead Data Central, the company providing access to LEXIS and NEXIS, offered some of the most advanced early technology for screen display. The reason for this is that they required proprietary terminals, much like the cataloging utilities. There was only one terminal that they would support, so they could afford to do a custom screen and custom keyboard design for searching. But Mead is the exception, not the rule.

Frequency of Use

The cataloging utilities were used a significant part of the work day, as a work station. Use of the reference utilities was intermittent, an "on demand" activity. In those first ten years, a few minutes a day was a typical level of use for most libraries using the reference services.

Services Used

Within a library, typically only one cataloging utility was used. Once again, proprietary terminals and customized displays could be supported. However, most libraries, even early on, used two or more reference utilities. Therefore, the most important reason for the change in the reference utilities' screen displays and interface designs has been competition.

Databases Used

Finally, with the cataloging utilities, just a few databases were used: book catalog information, occasionally serials catalog information, and sometimes holdings information (which might or might not have been considered part of the same database).

On the reference utilities, people used dozens of databases. The tolerances were quite different. I can remember doing an ASIS-sponsored seminar in about 1970--"Management of the Library in Transition,"--with Alan Benenfeld as a speaker. He was talking about the use of databases from reference utilities (there were virtually no commercial utilities then) and saying that no reference librarian should be forced to use more than four databases. We were all serious!

Source of Information

Originally, the information that was displayed by these services came from sources and publishers different from those for catalog utilities. (That's not true anymore, since BRS, SDC and Dialog all have databases that cover much of the MARC files.) But initially, the cataloging utilities were deriving their information from title pages and other portions of books. They had specific rules by which to catalog and provide field labels, etc.

On the reference utilities side, the derivative information came from many sources--technical reports, patents, journal articles, sometimes books. There really weren't any standards early on. There were a lot of *de facto* standards and conventions, however. Records from ERIC and NTIS, because they were early and of high quality, became standards that other systems copied.

The fact that many of these databases were already available in print was also a determining factor because many of the print codes determined how flexible the final databases were--how many fields they could have and whether there could be subfields, etc. The derivative natures of the online databases were very different for reference and for cataloging.

System Features

Now I think we're ready to discuss system features. I'm going to talk about records and command languages and other aspects of online searching on BRS, Dialog, and SDC. The material that you see here (see Figure 5) shows all the different systems that have been spawned by each of them. Joe was saying that he was going to do a genealogical study of the different online catalogs-- which systems came from Solinet and which came from WLN, which came from OCLC, etc. This is a mini-genealogical study of some of the reference systems. The Dartmouth system that is being demonstrated here at the conference is also a BRS derivative.

I bought some old reports that showed how some of the services had designed their records.[4] Some data was mnemonic; some was true hieroglyphics! There might be squares, a sigma sign, etc. You can imagine the user friendliness of that kind of display.

The next example is from BOLD, the bibliographic online display that was an early forerunner of SDC (see Figure 6). People who have known about Hal Borko for a long time know that system as "Borko's old lousy display," although it certainly did evolve into a very good service. This is an authority list that is the result of a search request. Each word that is followed by question marks, such as "SPACESHIPS," is in turn followed by a list of terms associated with that word. The system is not showing any line numbers but automatically putting together those related terms, if at some point the user was clever enough to tell the system to do that.

Other BOLD displays were quite imaginative and showing you an array of documents using multiple asterisks to represent occurrences of one or more of the six search terms. They show the density of the search request for each document. I don't know if any of you ever worked with Termatrex or Peekaboo optical coincidence systems, where the coordinate location of holes on multiple,

Figure 5

SYSTEMS FAMILIES

BRS------BRS Mini/Micro Search

--DataStar

--Colleague

--BRS

--BRS/After Dark

--Stairs

DIALOG-----DIALOG

--Recon (NASA and DOE)

--ESA/IRS

--KI

SDC--------SDC

--NLM/Wilson

Figure 6

```
SPACESHIPS?
THESE MAY BE RELATED TO SPACESHIPS
SPACESHIP CABINS
SPACESHIPS
SPACESHIPS - POWER SUPPLIES
SPACESHIPS - STABILITY
*END
SPACE?
THESE MAY BE RELATED TO SPACE
SPACE CAPSULES
SPACE CHARGES
SPACE ENVIRONMENTAL CONDITIONS
SPACE FLIGHT
SPACE FLIGHT - CONTROL
SPACE FLIGHT - SURVIVAL
SPACE MEDICINE
*CONTINUE?YES
SPACE MEDICINE - EFFECTIVENESS
SPACE NAVIGATION
SPACE PERCEPTION
SPACE PROBES
SPACE RECOVERY SYSTEMS, INC., EL SEGUNDO, CALIF.
SPACE SCIENCES LAB., GENERAL ELECTRIC CO., PHILADELPHIA, PA.
SPACE SHIPS
*CONTINUE?NO
LUNAR FLIGHTS?
*NOT FOUND
MOON FLIGHTS?
*NOT FOUND
MARS FLIGHTS?
*NOT FOUND
MOON?
THESE MAY BE RELATED TO MOON
MOON
MOON - ATMOSPHERE
*END
LUNAR?
THESE MAY BE RELATED TO LUNAR
LUNAR PROBES
*END
MARS?
THESE MAY BE RELATED TO MARS
MARS
MARSH CHARLES A.
MARSHALL JOHN M.
*END
```

drilled cards representing subjects is equivalent to the ID number for a document satisfying your search criteria. This gave essentially the same thing. It's just that you provide the eye ruler and determine which of these records have two or more coincidences for your retrieval.

Next is a DISPLAY SETS command--a recap of what's already taken place (see Figure 7). The set numbe is in one corner; the actual thing that's been requested is in the first line. Then over to the side under "Number of Citations," you have not only the number of citations for each individual instance but also the co-occurrences displayed a number of clever ways. Look how sophisticated this early system required searchers to be.[5]

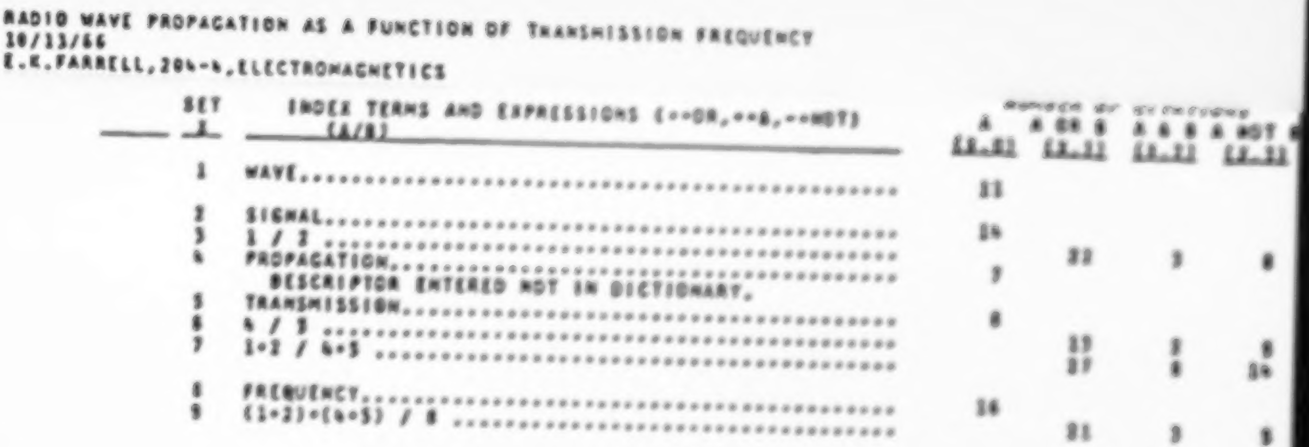
Command Language Evolution

I thought it would be useful to get a feel for how command languages have evolved (see Figure 8). I took Dialog and BOLD/SDC as examples and broke them down into uneven groupings of time frames. (The development time frames weren't even.) During the first, earliest time period (1966-68), there was a combination of menu and question and answer, with very little command. At that time the systems really were prototypes; they weren't being sold to people. Typically they were the result of contracts for agencies like NASA or the National Library of Medicine. There really weren't any users in the 60's for those online services--or very, very few.

By 1970 the command languages included tutorials and simple commands. A number of simple commands that were added then remain to this day--probably half a dozen. They have become the core from which all the online services have developed. Even though they're called by different names, whether it's SELECT or FIND,

Figure 7

SAMPLE SET DISPLAY



```
RADIO WAVE PROPAGATION AS A FUNCTION OF TRANSMISSION FREQUENCY
10/13/66
E.K.FARRELL,204-4,ELECTROMAGNETICS
                                                                           NUMBER OF CITATIONS
          SET    INDEX TERMS AND EXPRESSIONS (+=OR,*=&,-=NOT)           A     A OR B   A & B  A NOT
  ______  _I_    ________(A/B)_______________________________      [illegible] [illegible] [illegible] [illegible]

           1     WAVE..........................................     11

           2     SIGNAL........................................     14
           3     1 / 2 ........................................             22       3       8
           4     PROPAGATION...................................      7
                   DESCRIPTOR ENTERED NOT IN DICTIONARY.
           5     TRANSMISSION..................................      8
           6     4 / 5 ........................................             13       2       9
           7     1+2 / 4+5 ....................................             17       4      14

           8     FREQUENCY.....................................     16
           9     (1+2)*(4+5) / 8 ..............................             21       3       5
```

Figure 8

Language Evolution and Number of System Users

Characteristics of Language	Year	Number of System Users	Year
Menu/Question and Answer	1966	Not applicable (Prototypes)	
Tutorials and Simple Commands	1970	50	1969
Multiple Sophisticated Commands	1974	500	1973
Simpler Commands	1976	5,000	1977
Sophisticated Commands	1980		
Industry "Standards"	1980-	50,000	1981
End User Systems	1982		
		500,000	1985

they really mean the same thing: "Go out and get whatever I've just asked for." By about 1969, (and these estimates are from Carlos Cuadra's imagination) we see an interesting pattern. Every four years Cuadra envisions an order of magnitude growth in the number of online users. I mention that because the number of users obviously determines the money that's coming in, and that in turn determines the amount of money that you can spend on development.

Looking from 1969-1981, you can see that we've gone from virtually no users up to about 50,000 users. And these are users of bibliographic systems. These are not just users of online systems. That's an important distinction to make. I find it hard to believe that by the end of 1985 there really will be 500,000 users of bibliographic systems, but I can easily be wrong. Look at all these OPACS! That's what we're here for, so Cuadra may be right again. It looks as if that may be coming true.

There's a sort of a "blip" in the system that's rather interesting. In 1970, menus, tutorials, and simple commands were in effect, but by 1974 sophisticated commands--everything but the kitchen sink--were available on Dialog and SDC. Apparently there was a bit of an overload; several sophisticated but non-essential features were taken off the systems between 1974 and 1976. Only over a period of time were some of these features brought into the systems again. Designers realized that there has to be some level of absorption and education and customer support before people can assimilate such an enormous amount, even though this market was an educated market of information professionals whose business it was to deal with this kind of material every day. The services couldn't afford to support this sophistication at the early stages.

In the last four or five years the focus has been on the end user. The other thing that's happened is stiff competition. Both the users of these services and the publishers go from service to service to get more leverage (better service and better royalties, respectively). They press the reference services to increase the number of features, particularly the good ones, so the best features survive and emerge in other services (e.g., DIALOG II incorporated some of BRS' best ideas. BRS in turn offers optional pricing equivalent to DIALOG's, and SDC's ORBIT is now offering proximity searching, etc.). It's a cross-fertilization process.

The last thing I wanted to mention was the whole range of offshoots from two *end user* services designed by bibliographic reference providers: Dialog's KNOWLEDGE INDEX, and BRS's AFTER DARK service. Following the introduction of those services by about a year were a whole host of "gateway" services--software that would allow "easy access" to the many information utilities, starting with those with the biggest installed base. INSEARCH, for example, started out with just Dialog. Now there's a new service out of Menlo Corp. (they produce INSEARCH); it's called PROSEARCH and covers both Dialog and BRS. Telebase is a company that's providing a service called EASYNET. It's starting with access to the bibliographic databases. It's meant to be a very primitive expert system that allows anybody to use a credit card to pay for one search at a time. The user just types out the search. The system chooses the database, chooses the system to search on, and then executes the search and provides the user with a set number of records as the result. That's what you pay for. There will probably be quite a few more of these end user systems in the near future.

Sample Displays From Today's Services

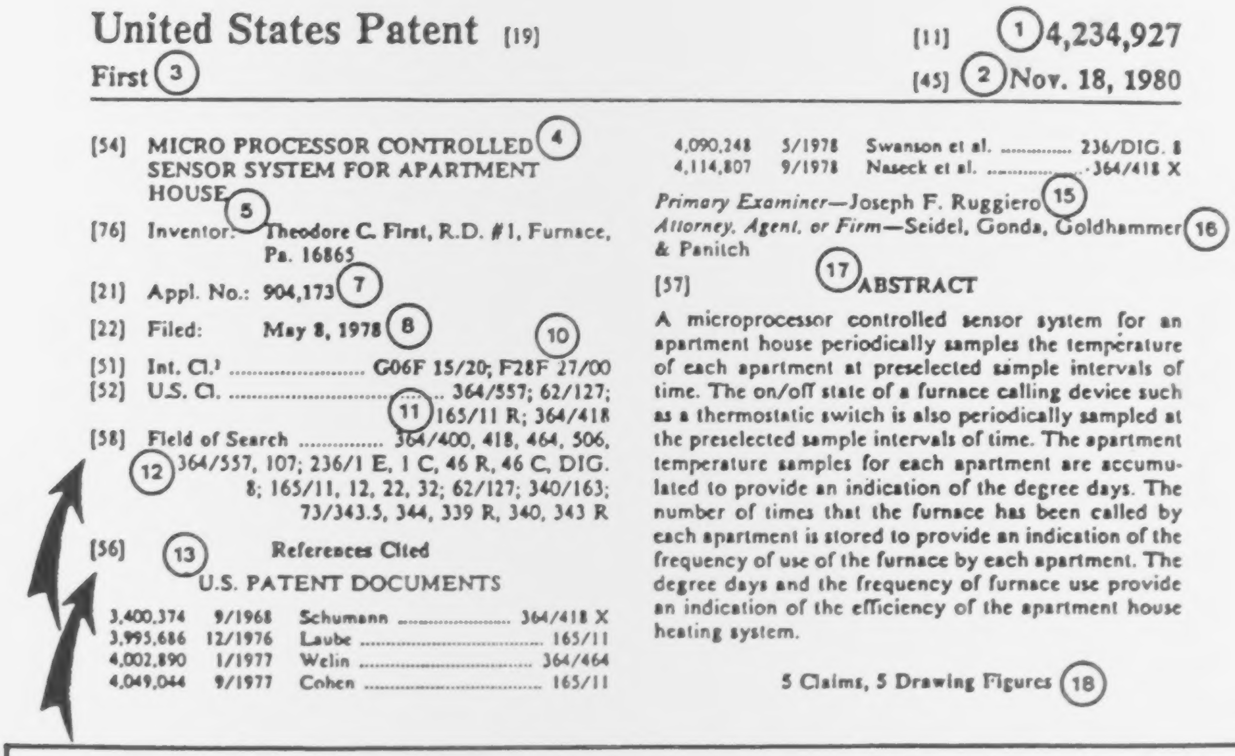
Now I have just a couple of sample pages for one standard set of original documents, *The Official Gazette* (for patents). Patent documents are constant, so you would assume that the way they are described would also be constant and consistent. But that's not at all true. Figure 9 shows the first page of a patent. Figure 10 shows what the full patent looks like. What I'm getting at is the different levels of the primary literature, followed by the secondary literature, which is really the *Official Gazette*.[6]

Figure 11 shows two things. At the lower right hand corner it shows a copy of the *Official Gazette* that describes that particular patent. The upper portion of the page is the Dialog record, from CLAIMS, which is one of the many patent files available. At the very bottom it shows the different fields that describe that. They're very different for each of the different patent files. They're different in two ways. One, for a while each file that came from a different publisher was mounted on a different system, so you had publisher differences and vendor differences combined within the same database.

The next example (see Figure 12) is from SDC. I think you can see that it looks quite different. The sequence of information is quite different; the amount of information that is selected is very different.

Figure 9

PATENT RECORD--FIRST PAGE



United States Patent [19]
First ③

[11] ① **4,234,927**
[45] ② **Nov. 18, 1980**

[54] **MICRO PROCESSOR CONTROLLED SENSOR SYSTEM FOR APARTMENT HOUSE** ④

[76] Inventor: ⑤ Theodore C. First, R.D. #1, Furnace, Pa. 16865

[21] Appl. No.: 904,173 ⑦

[22] Filed: May 8, 1978 ⑧

⑩
[51] Int. Cl.³ G06F 15/20; F28F 27/00
[52] U.S. Cl. .... 364/557; 62/127; ⑪ 165/11 R; 364/418
[58] Field of Search .... 364/400, 418, 464, 506, ⑫ 364/557, 107; 236/1 E, 1 C, 46 R, 46 C, DIG. 8; 165/11, 12, 22, 32; 62/127; 340/163; 73/343.5, 344, 339 R, 340, 343 R

[56] ⑬ **References Cited**

U.S. PATENT DOCUMENTS

3,400,374	9/1968	Schumann	364/418 X
3,995,686	12/1976	Laube	165/11
4,002,890	1/1977	Welin	364/464
4,049,044	9/1977	Cohen	165/11
4,090,248	5/1978	Swanson et al.	236/DIG. 8
4,114,807	9/1978	Naseck et al.	364/418 X

Primary Examiner—Joseph F. Ruggiero ⑮
Attorney, Agent, or Firm—Seidel, Gonda, Goldhammer & Panitch ⑯

[57] ⑰ **ABSTRACT**

A microprocessor controlled sensor system for an apartment house periodically samples the temperature of each apartment at preselected sample intervals of time. The on/off state of a furnace calling device such as a thermostatic switch is also periodically sampled at the preselected sample intervals of time. The apartment temperature samples for each apartment are accumulated to provide an indication of the degree days. The number of times that the furnace has been called by each apartment is stored to provide an indication of the frequency of use of the furnace by each apartment. The degree days and the frequency of furnace use provide an indication of the efficiency of the apartment house heating system.

5 Claims, 5 Drawing Figures ⑱

(The numbers in brackets beside each element on the first page refer to an International coding standard. They designate fields which apply to all patents issued worldwide, and are used with PCT patent applications.)

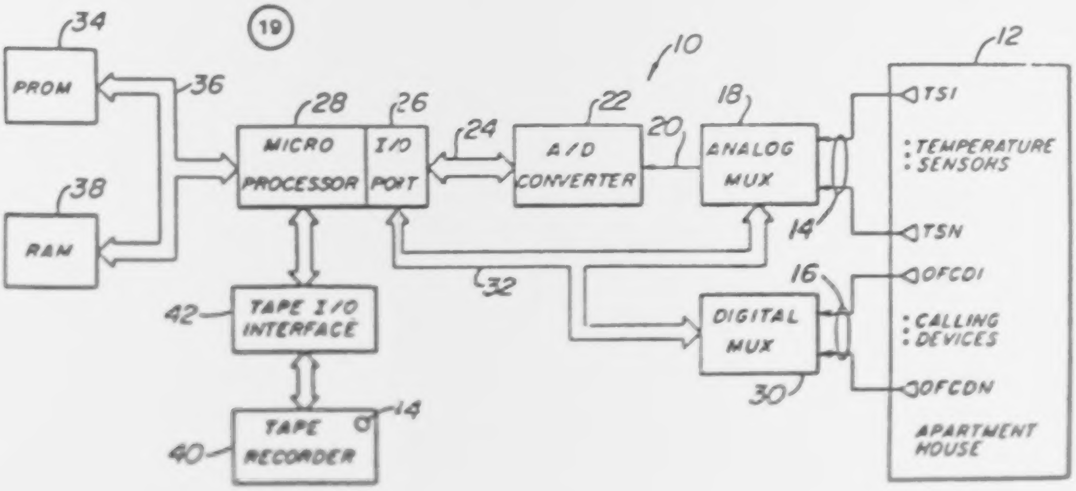

⑲
34
PROM
36
38
RAM
28
MICRO PROCESSOR
26
I/O PORT
24
22
A/D CONVERTER
10
20
18
ANALOG MUX
14
12
TS1
TEMPERATURE SENSORS
TSN
OFCD1
CALLING DEVICES
OFCDN
APARTMENT HOUSE
16
32
DIGITAL MUX
30
42
TAPE I/O INTERFACE
14
TAPE RECORDER
40

Figure 10

PATENT RECORD--FULL PATENT

MICRO PROCESSOR CONTROLLED SENSOR SYSTEM FOR APARTMENT HOUSE

⑳ BACKGROUND OF THE INVENTION

The present invention is directed to a microprocessor controlled sensor system for an apartment house. The invention periodically collects data for use in evaluating the operation of the apartment house heating system. Apartment temperature data is obtained by sampling a single temperature sensor located in the return air plenum of an apartment at preselected sample intervals of time. A single on/off calling device in the apartment is also sampled at the preselected sample intervals of time. Sampling of the temperature sensors and on/off calling devices for all of the apartments is controlled by a single microprocessor unit which is conveniently located at a remote working area. No data processing circuitry is located in any of the apartments. The collected data is stored on a day-by-day basis in a conventional tape cassette.

Degree day data loggers are known in the art. For example, see U.S. Pat. No. 3,911,746. The data logger described therein consists of a bridge circuit provided with a temperature sensing element in one arm, a comparator, and an elapsed time meter. Any change in temperature indicated by the bridge output is compared to a reference temperature by the comparator, and the comparator output is accumulated to provide an indication of degree days with respect to the reference temperature. Apparently, the data logger can accumulate degree days for only a single temperature sensing element.

The allocation of fuel costs among plural apartments in an apartment house is also known. For example, see U.S. Pat. No. 4,002,890. Corresponding to each apartment, there are several temperature sensors which are used to compute a weighted mean temperature for the apartment. Apparently, each apartment requires its own analog computer circuit to effect the allocation of fuel costs based on the weighted temperatures.

The computation of internal degree days with respect to an external temperature norm is also known. See U.S. Pat. No. 2,652,724.

An advantage of the present invention is that data indicating the performance of a heating system for an apartment house is automatically collected for evaluation on a day-by-day basis.

Another advantage of the invention is that it can be easily and rapidly installed in an apartment house without the addition of elaborate or expensive hardware components.

A further advantage of the invention is that all of the data processing elements may be located in a remote working area.

Other advantages appear hereinafter.

㉑ BRIEF SUMMARY OF THE INVENTION

A microprocessor controlled sensor system for an apartment house having plural apartments and a furnace for heating the apartments. Plural temperature sensors sense the temperatures of the apartments and generate a set of apartment temperature signals. Each temperature sensor is located in one of the apartments. Plural on/off state calling devices operate the furnace and generate a set of digital signals which indicate whether the furnace is being operated. Each of the calling devices is located in one of the apartments and is associated with the temperature sensor located in the same apartment. Temperature sensor processing means convert the apartment temperature signals into a sequence of digital words. Each word represents the temperature of an apartment. Calling device processing means convert the calling device digital signals into a sequence of digital words. Each word represents the state of a calling device. A programmed microprocessor causes the temperature sensor processing means and the calling device processing means to perform the conversion operations at preselected intervals of time. The apartment temperature words are accumulated for each apartment. A count of the number of times that the furnace is operated is also accumulated for each apartment.

BRIEF DESCRIPTION OF THE DRAWINGS ㉒

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a block diagram of the microprocessor controlled energy system of the present invention.

FIGS. 2A-2D comprise a flow chart diagram of the operation of the invention.

DETAILED DESCRIPTION OF THE INVENTION ㉓

Referring to the drawings in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 a microprocessor controlled sensor system 10 according to the present invention. A bank of temperature sensors TS1-TSN are located within the apartments of an apartment house 12. Each of the temperature sensors TS1-TSN is located in one apartment in the apartment house 12. No apartment has more than one temperature sensor. Preferably, each temperature sensor TS1-TSN is located in the return air plenum (not shown) of an apartment. The temperature sensors continuously sense the temperature in the apartments and generate a set of analog apartment temperature signals 14 each of which represent the temperature in one apartment.

A bank of on/off state calling devices OFCD1-OFCDN are also located in the apartments. Each calling device OFCD1-OFCDN is located in one of the apartments. None of the apartments has more than one calling device. Accordingly, each of the calling devices is associated with one of the temperature sensors TS1-TSN. The calling devices may be conventional thermostatic switches provided in modern apartment houses. The calling devices continuously indicate whether the apartment house furnace is being called or operated by the resident of the apartment to supply energy in the form of heat to the apartment. For example, closure of the thermostatic switch would indicate that the furnace is being called by the apartment. If the thermostatic switch is not closed, it indicates that the furnace is not being called by the apartment.

The calling devices OFCD1-OFCDN generate signals which, at any given instant of time, are in either one of two states: on or off. Accordingly, the devices are compatible with binary logic. Of course, the voltage levels of the signals generated by the calling devices OFCD1-OFCDN may be shifted by conventional circuitry (not shown) to render the signal levels fully compatible with any digital logic voltages desired.

Figure 11

PATENT RECORD ON THE CLAIMS DATABASE
COMPARED TO OFFICIAL GAZETTE

1290792   2041051
E/ MICRO PROCESSOR CONTROLLED SENSOR SYSTEM FOR APARTMENT HOUSE
Inventors: FIRST THEODORE C
Assignee Names: UNASSIGNED OR ASSIGNED TO INDIVIDUAL Assignee Codes: 68000
Patent No.: 4234927   (Cited in 009 later patents)
Issue Date: 801118 Pub Year: 1980   Document Type: UTILITY
Application (Date No.): 780508 904173
Abstract:

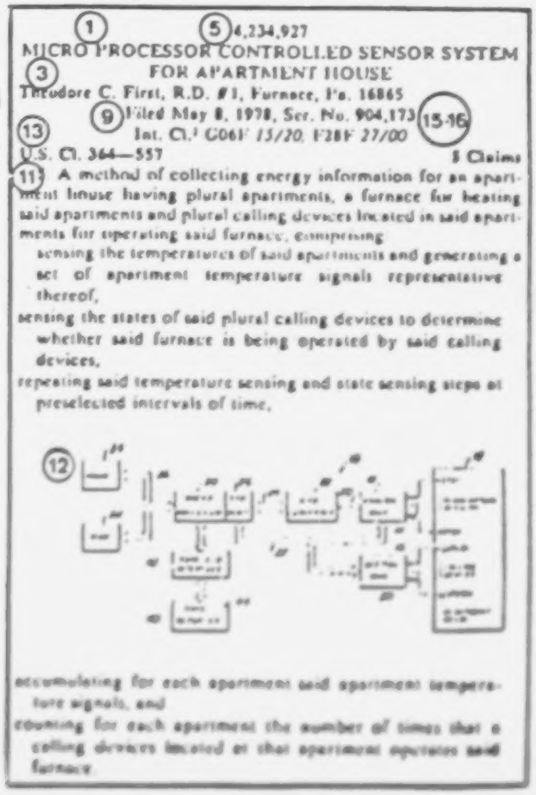
A MICROPROCESSOR CONTROLLED SENSOR SYSTEM FOR AN APARTMENT HOUSE PERIODICALLY SAMPLES THE TEMPERATURE OF EACH APARTMENT AT PRESELECTED SAMPLE INTERVALS OF TIME. THE ON/OFF STATE OF A FURNACE CALLING DEVICE SUCH AS A THERMOSTATIC SWITCH IS ALSO PERIODICALLY SAMPLED AT THE PRESELECTED SAMPLE INTERVALS OF TIME. THE APARTMENT TEMPERATURE SAMPLES FOR EACH APARTMENT ARE ACCUMULATED TO PROVIDE AN INDICATION OF THE DEGREE DAYS. THE NUMBER OF TIMES THAT THE FURNACE HAS BEEN CALLED BY EACH APARTMENT IS STORED TO PROVIDE AN INDICATION OF THE FREQUENCY OF USE OF THE FURNACE BY EACH APARTMENT. THE DEGREE DAYS AND THE FREQUENCY OF FURNACE USE PROVIDE AN INDICATION OF THE EFFICIENCY OF THE APARTMENT HOUSE HEATING SYSTEM.

Claim:

5. A METHOD OF COLLECTING ENERGY INFORMATION FOR AN APARTMENT HOUSE HAVING PLURAL APARTMENTS, A FURNACE FOR HEATING SAID APARTMENTS AND PLURAL CALLING DEVICES LOCATED IN SAID APARTMENTS FOR OPERATING SAID FURNACE, COMPRISING: SENSING THE TEMPERATURES OF SAID APARTMENTS AND GENERATING A SET OF APARTMENTS TEMPERATURE SIGNALS REPRESENTATIVE THEREOF, SENSING THE STATES OF SAID PLURAL CALLING DEVICES TO DETERMINE WHETHER SAID FURNACE IS BEING OPERATED BY SAID CALLING DEVICES, REPEATING SAID TEMPERATURE SENSING AND STATE SENSING STEPS AT PRESELECTED INTERVALS OF TIME,

DRAWING

ACCUMULATING FOR EACH APARTMENT SAID APARTM
COUNTING FOR EACH APARTMENT THE NUMBER OF
LOCATED AT THAT APARTMENT OPERATES SAID FURNACE



① ⑤ 4,234,927
MICRO PROCESSOR CONTROLLED SENSOR SYSTEM FOR APARTMENT HOUSE
③ Theodore C. First, R.D. #1, Furnace, Pa. 16865
⑨ Filed May 8, 1978, Ser. No. 904,173 (15-16)
⑬ Int. Cl.³ G06F 15/20, F28F 27/00
U.S. Cl. 364—557   5 Claims

⑪ 5. A method of collecting energy information for an apartment house having plural apartments, a furnace for heating said apartments and plural calling devices located in said apartments for operating said furnace, comprising

sensing the temperatures of said apartments and generating a set of apartment temperature signals representative thereof,

sensing the states of said plural calling devices to determine whether said furnace is being operated by said calling devices,

repeating said temperature sensing and state sensing steps at preselected intervals of time,

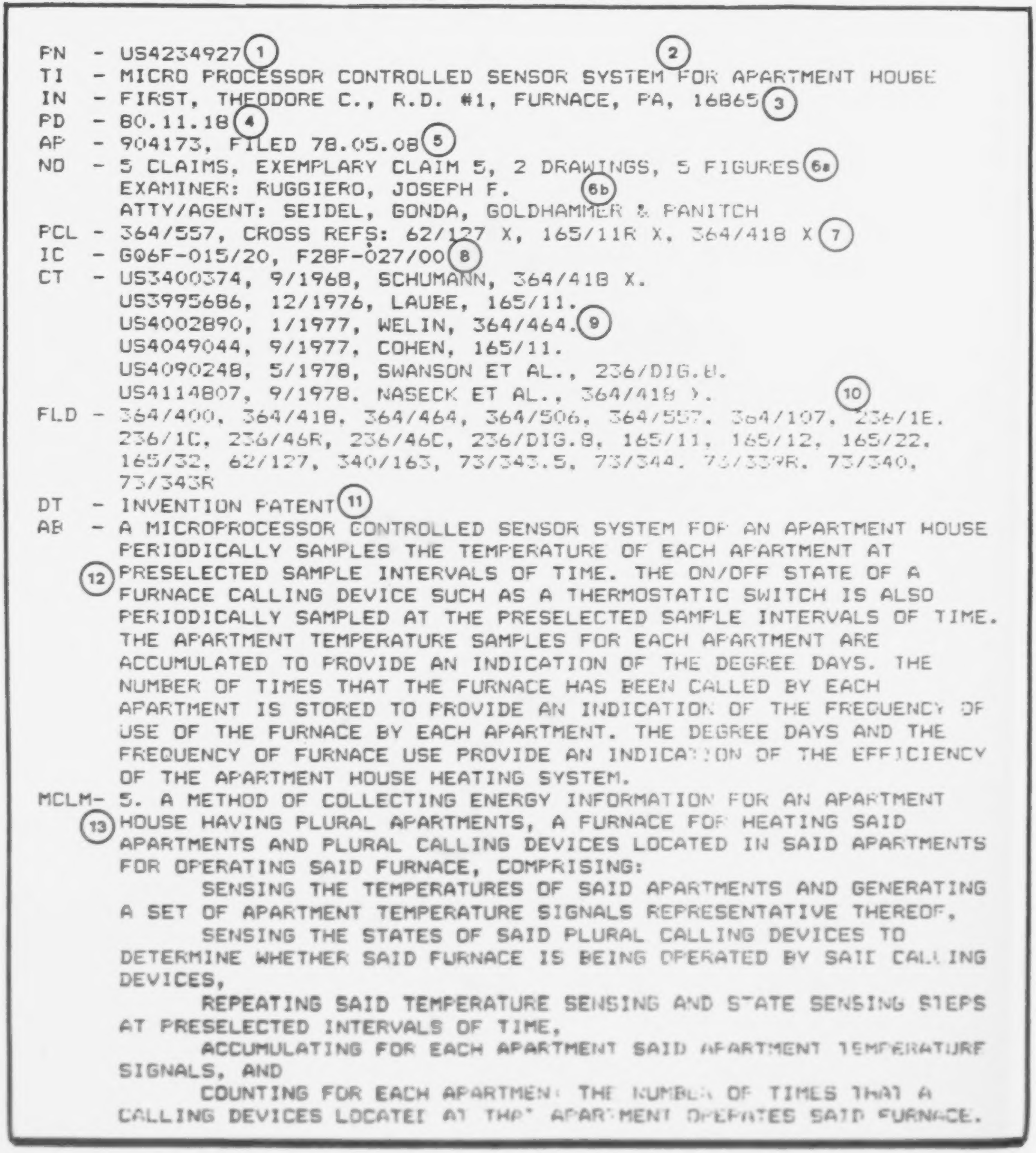
accumulating for each apartment said apartment temperature signals, and

counting for each apartment the number of times that a calling devices located at that apartment operates said furnace.

BEST COPY AVAILABLE

Figure 12

ONLINE PATENT RECORD



```
PN   - US4234927①                                         ②
TI   - MICRO PROCESSOR CONTROLLED SENSOR SYSTEM FOR APARTMENT HOUSE
IN   - FIRST, THEODORE C., R.D. #1, FURNACE, PA, 16865③
PD   - 80.11.18④
AP   - 904173, FILED 78.05.08⑤
ND   - 5 CLAIMS, EXEMPLARY CLAIM 5, 2 DRAWINGS, 5 FIGURES(6a)
       EXAMINER: RUGGIERO, JOSEPH F.        (6b)
       ATTY/AGENT: SEIDEL, GONDA, GOLDHAMMER & PANITCH
PCL  - 364/557, CROSS REFS: 62/127 X, 165/11R X, 364/418 X⑦
IC   - G06F-015/20, F28F-027/00⑧
CT   - US3400374, 9/1968, SCHUMANN, 364/418 X.
       US3995686, 12/1976, LAUBE, 165/11.
       US4002890, 1/1977, WELIN, 364/464.⑨
       US4049044, 9/1977, COHEN, 165/11.
       US4090248, 5/1978, SWANSON ET AL., 236/DIG.8.
       US4114807, 9/1978, NASECK ET AL., 364/418 X.          ⑩
FLD  - 364/400, 364/418, 364/464, 364/506, 364/557, 364/107, 236/1E,
       236/1C, 236/46R, 236/46C, 236/DIG.8, 165/11, 165/12, 165/22,
       165/32, 62/127, 340/163, 73/343.5, 73/344, 73/339R, 73/340,
       73/343R
DT   - INVENTION PATENT⑪
AB   - A MICROPROCESSOR CONTROLLED SENSOR SYSTEM FOR AN APARTMENT HOUSE
       PERIODICALLY SAMPLES THE TEMPERATURE OF EACH APARTMENT AT
     ⑫PRESELECTED SAMPLE INTERVALS OF TIME. THE ON/OFF STATE OF A
       FURNACE CALLING DEVICE SUCH AS A THERMOSTATIC SWITCH IS ALSO
       PERIODICALLY SAMPLED AT THE PRESELECTED SAMPLE INTERVALS OF TIME.
       THE APARTMENT TEMPERATURE SAMPLES FOR EACH APARTMENT ARE
       ACCUMULATED TO PROVIDE AN INDICATION OF THE DEGREE DAYS. THE
       NUMBER OF TIMES THAT THE FURNACE HAS BEEN CALLED BY EACH
       APARTMENT IS STORED TO PROVIDE AN INDICATION OF THE FREQUENCY OF
       USE OF THE FURNACE BY EACH APARTMENT. THE DEGREE DAYS AND THE
       FREQUENCY OF FURNACE USE PROVIDE AN INDICATION OF THE EFFICIENCY
       OF THE APARTMENT HOUSE HEATING SYSTEM.
MCLM- 5. A METHOD OF COLLECTING ENERGY INFORMATION FOR AN APARTMENT
     ⑬HOUSE HAVING PLURAL APARTMENTS, A FURNACE FOR HEATING SAID
       APARTMENTS AND PLURAL CALLING DEVICES LOCATED IN SAID APARTMENTS
       FOR OPERATING SAID FURNACE, COMPRISING:
               SENSING THE TEMPERATURES OF SAID APARTMENTS AND GENERATING
       A SET OF APARTMENT TEMPERATURE SIGNALS REPRESENTATIVE THEREOF,
               SENSING THE STATES OF SAID PLURAL CALLING DEVICES TO
       DETERMINE WHETHER SAID FURNACE IS BEING OPERATED BY SAID CALLING
       DEVICES,
               REPEATING SAID TEMPERATURE SENSING AND STATE SENSING STEPS
       AT PRESELECTED INTERVALS OF TIME,
               ACCUMULATING FOR EACH APARTMENT SAID APARTMENT TEMPERATURE
       SIGNALS, AND
               COUNTING FOR EACH APARTMENT THE NUMBER OF TIMES THAT A
       CALLING DEVICES LOCATED AT THAT APARTMENT OPERATES SAID FURNACE.
```

The last example is from BRS (see Figure 13). Once again, the things that have been chosen by BRS are quite different. The sequence is different, the coding is different, the fields that are used, the labels are different, etc.

Figure 3 shows the three services' versions of the same record from Management Contents.[7] You can see that BRS and SDC, the top and the bottom, have field labels. They're capable of having the full title. They're capable of writing out number, title, etc., instead of just AN, TI, etc. Dialog does not even use field labels. There are also a number of fields that are in different sequence among the three. Some services use codes, where others spell things out within the body of their record. The ways in which they show different fields also vary. Within one system, such as Dialog, you can have the author field showing an author with last names always first, but that's about the only convention that is sacred. After that it's anybody's guess. It can have a comma after the last name; it can have first names or a first name and a middle name; it can have initials; it can have no punctuation whatsoever, etc. There's no consistency.

Figure 14 is from one of the PROMT database abstract journals, Marketing Ideas. There are two things that I want to point out here. Right after each record there's a tiny print code; it has been included for photocomposition purposes. It's meaningless. On the other hand, there are often things that are missing from the online version of a particular file that are really essential guides, roadmaps for the structure of the database. They don't get translated into the online database. One example is the "Asset Management." That really provides you some idea of what categories are being covered by that particular record. And that's not included anywhere within the database record itself; it's just in the print tool.

Figure 15 shows the online record for that print record that you just saw--very different looking, as is probably not surprising to you.

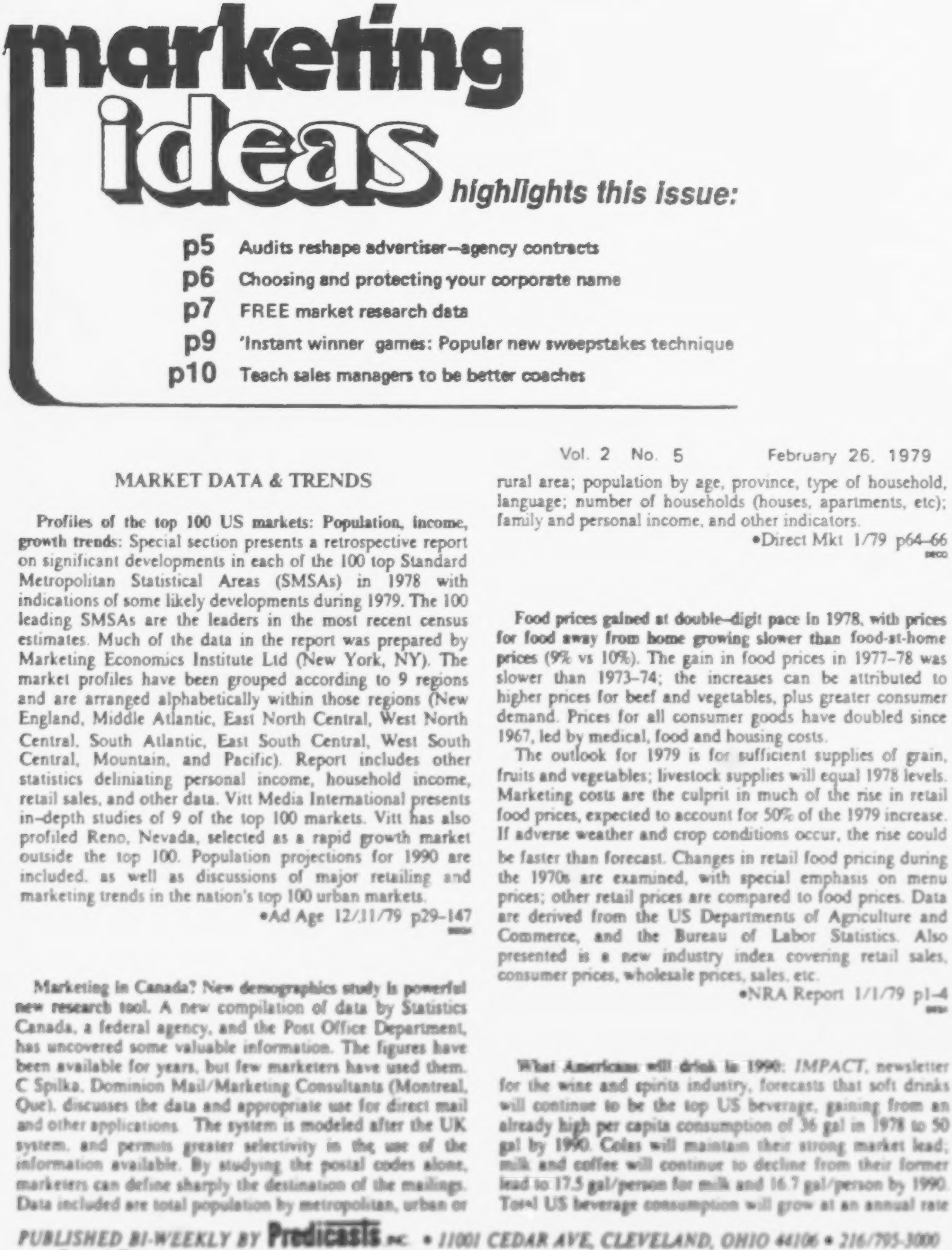
Figure 13

BRS PATENT RECORD

```
*①PN US 4234927.
  PD NOV 18, 1980.②       ③
  TI MICRO PROCESSOR CONTROLLED SENSOR SYSTEM FOR APARTMENT HOUSE.
  IV FIRST-THEODORE-C.④
  IA FURNACE PA 16865.⑤
  AP 904173 MAY 08, 1978.⑥
  OR 364/557.⑦
  XR 62/127.  165/11R.⑧ 364/418.
  IC G06F 15/20.  F28F 27/00.⑨ EDITION 2.
  RU 3400374, SEP 1968.  3995686, DEC 1976. ⑩4002890, JAN 1977.  4049044,
     SEP 1977.  4090248, MAY 1978.  4114807, SEP 1978.
  AB A MICROPROCESSOR CONTROLLED SENSOR SYSTEM FOR AN APARTMENT HOUSE
    ⑪PERIODICALLY SAMPLES THE TEMPERATURE OF EACH APARTMENT AT PRESELECTED
     SAMPLE INTERVALS OF TIME.  THE ON/OFF STATE OF A FURNACE CALLING
     DEVICE SUCH AS A THERMOSTATIC SWITCH IS ALSO PERIODICALLY SAMPLED AT
     THE PRESELECTED SAMPLE INTERVALS OF TIME.  THE APARTMENT TEMPERATURE
     SAMPLES FOR EACH APARTMENT ARE ACCUMULATED TO PROVIDE AN INDICATION
     OF THE DEGREE DAYS.  THE NUMBER OF TIMES THAT THE FURNACE HAS BEEN
     CALLED BY EACH APARTMENT IS STORED TO PROVIDE AN INDICATION OF THE
     FREQUENCY OF USE OF THE FURNACE BY EACH APARTMENT.  THE DEGREE DAYS
     AND THE FREQUENCY OF FURNACE USE PROVIDE AN INDICATION OF THE
     EFFICIENCY OF THE APARTMENT HOUSE HEATING SYSTEM.
```

Figure 14

MARKETING IDEAS DISPLAY #1



marketing ideas

highlights this issue:

p5 Audits reshape advertiser–agency contracts
p6 Choosing and protecting your corporate name
p7 FREE market research data
p9 'Instant winner games: Popular new sweepstakes technique
p10 Teach sales managers to be better coaches

Vol. 2 No. 5 February 26, 1979

MARKET DATA & TRENDS

Profiles of the top 100 US markets: Population, income, growth trends: Special section presents a retrospective report on significant developments in each of the 100 top Standard Metropolitan Statistical Areas (SMSAs) in 1978 with indications of some likely developments during 1979. The 100 leading SMSAs are the leaders in the most recent census estimates. Much of the data in the report was prepared by Marketing Economics Institute Ltd (New York, NY). The market profiles have been grouped according to 9 regions and are arranged alphabetically within those regions (New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific). Report includes other statistics deliniating personal income, household income, retail sales, and other data. Vitt Media International presents in–depth studies of 9 of the top 100 markets. Vitt has also profiled Reno, Nevada, selected as a rapid growth market outside the top 100. Population projections for 1990 are included, as well as discussions of major retailing and marketing trends in the nation's top 100 urban markets.

•Ad Age 12/11/79 p29–147

Marketing in Canada? New demographics study is powerful new research tool. A new compilation of data by Statistics Canada, a federal agency, and the Post Office Department, has uncovered some valuable information. The figures have been available for years, but few marketers have used them. C Spilka, Dominion Mail/Marketing Consultants (Montreal, Que), discusses the data and appropriate use for direct mail and other applications. The system is modeled after the UK system, and permits greater selectivity in the use of the information available. By studying the postal codes alone, marketers can define sharply the destination of the mailings. Data included are total population by metropolitan, urban or rural area; population by age, province, type of household, language; number of households (houses, apartments, etc); family and personal income, and other indicators.

•Direct Mkt 1/79 p64–66

Food prices gained at double–digit pace in 1978, with prices for food away from home growing slower than food-at-home prices (9% vs 10%). The gain in food prices in 1977–78 was slower than 1973–74; the increases can be attributed to higher prices for beef and vegetables, plus greater consumer demand. Prices for all consumer goods have doubled since 1967, led by medical, food and housing costs.

The outlook for 1979 is for sufficient supplies of grain, fruits and vegetables; livestock supplies will equal 1978 levels. Marketing costs are the culprit in much of the rise in retail food prices, expected to account for 50% of the 1979 increase. If adverse weather and crop conditions occur, the rise could be faster than forecast. Changes in retail food pricing during the 1970s are examined, with special emphasis on menu prices; other retail prices are compared to food prices. Data are derived from the US Departments of Agriculture and Commerce, and the Bureau of Labor Statistics. Also presented is a new industry index covering retail sales, consumer prices, wholesale prices, sales, etc.

•NRA Report 1/1/79 p1–4

What Americans will drink in 1990: *IMPACT*, newsletter for the wine and spirits industry, forecasts that soft drinks will continue to be the top US beverage, gaining from an already high per capita consumption of 36 gal in 1978 to 50 gal by 1990. Colas will maintain their strong market lead; milk and coffee will continue to decline from their former lead to 17.5 gal/person for milk and 16.7 gal/person by 1990. Total US beverage consumption will grow at an annual rate

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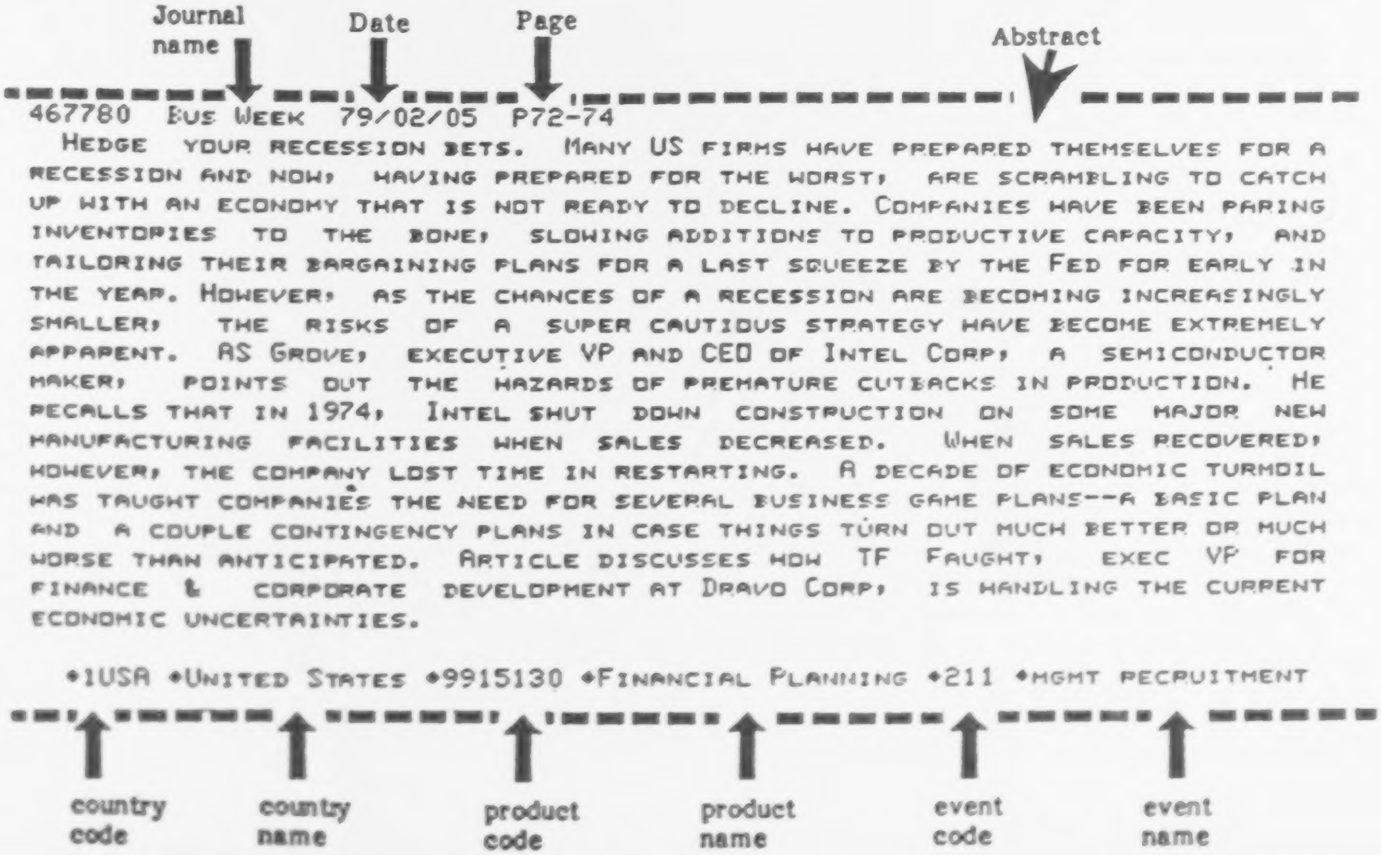
Figure 15

MARKETING IDEAS DISPLAY #2

This online abstract, printed from DIALOG's file 16, corresponds to the first abstract in Predicasts' newsletters Financial Ideas for February 19, 1979. The abstract content is identical for the two media, but the online record includes indexing information, by country, by product, and by event. The broad subject heading assigned to this abstract in the printed version ("Asset Management") has not been used as an index point in the online record.


Journal name
Date
Page
Abstract
country code
country name
product code
product name
event code
event name

```
467780  BUS WEEK  79/02/05  P72-74
  HEDGE YOUR RECESSION BETS.  MANY US FIRMS HAVE PREPARED THEMSELVES FOR A
RECESSION AND NOW,  HAVING PREPARED FOR THE WORST,  ARE SCRAMBLING TO CATCH
UP WITH AN ECONOMY THAT IS NOT READY TO DECLINE. COMPANIES HAVE BEEN PARING
INVENTORIES  TO  THE  BONE,  SLOWING ADDITIONS TO PRODUCTIVE CAPACITY,  AND
TAILORING THEIR BARGAINING PLANS FOR A LAST SQUEEZE BY THE FED FOR EARLY IN
THE YEAR. HOWEVER,  AS THE CHANCES OF A RECESSION ARE BECOMING INCREASINGLY
SMALLER,  THE  RISKS  OF  A  SUPER CAUTIOUS STRATEGY HAVE BECOME EXTREMELY
APPARENT.  AS GROVE,  EXECUTIVE VP AND CEO OF INTEL CORP,  A  SEMICONDUCTOR
MAKER,  POINTS  OUT  THE  HAZARDS OF PREMATURE CUTBACKS IN PRODUCTION.  HE
RECALLS THAT IN 1974,  INTEL SHUT  DOWN  CONSTRUCTION  ON  SOME  MAJOR  NEW
MANUFACTURING  FACILITIES  WHEN  SALES  DECREASED.   WHEN  SALES RECOVERED,
HOWEVER, THE COMPANY LOST TIME IN RESTARTING.  A DECADE OF ECONOMIC TURMOIL
HAS TAUGHT COMPANIES THE NEED FOR SEVERAL BUSINESS GAME PLANS--A BASIC PLAN
AND  A COUPLE CONTINGENCY PLANS IN CASE THINGS TURN OUT MUCH BETTER OR MUCH
WORSE THAN ANTICIPATED.  ARTICLE DISCUSSES HOW  TF  FAUGHT,   EXEC  VP  FOR
FINANCE  &   CORPORATE  DEVELOPMENT AT DRAVO CORP,  IS HANDLING THE CURRENT
ECONOMIC UNCERTAINTIES.

   *1USA *UNITED STATES *9915130 *FINANCIAL PLANNING *211 *MGMT RECRUITMENT
```

You can see in Figure 16 that text words are searched differently. On NLM's version of MEDLINE, if you want to search for the word "low" you must input low with (TW) after it. On BRS you just input low; with Dialog you input s space low. When using adjacency or proximity searching--very common when searching a phrase of any kind--for NLM you input low (tw) AND level (tw) for "low level". On BRS it's a little easier; you type low ADJ [adjacent] level. For Dialog there's a little bit of a mythical sound to this: S (for select), space, low and (W) (meaning zero words) then level. Talk about abstract concepts! You can see for each and every one of the fields that is searched on MEDLINE, each of the three services provides a different approach. That's got to create a little confusion, particularly if at some point in the future there are any (or many) of you who want to work the online reference utilities in with your online catalogs.

Figure 17 shows an authority list as it exists in print. This is from Psychological Abstracts. The next page (see Figure 18) is also from Psychological Abstracts printed materials. It shows a rotated alphabetical term section. These are common types of displays in print. At a 1971 conference, everybody agreed that a similar feature for online systems would be great to have. They called it a "browse" facility. That got translated by the three services--who probably thought "browse" was far too common a word--to "root," "neighbor," and "expand," all words that we use every day, in exactly that way, right?

Figure 19 shows an online thesaurus. The top display is an EXPAND display from Dialog. On the right hand side are the related terms. Each of the lines is numbered. There is an incentive for numbering on Dialog, as with all of the services; how else can the user select things easily? If the user can't select items from displays they can't be referenced in order to be printed and there's a dissatisfied customer and a loss of revenue. There's a direct, easy incentive plan built into the reference services. The next display, the one that's labeled A, shows the relationships of a specific set within that thesaurus. In this case it's EXPAND E3. If you go up and look at "body image," which is the third line of the top display, you see the relationships for that specific term.

Finally, you can see on the next page (see Figure 20) the way that you would have a rotated display in an online service. There are translations for everything.

Figure 16

Command Language

Examples: TEXTWORDS

NLM	LOW (TW)
BRS:	LOW
DIALOG:	S LOW

Examples: ADJACENCY

NLM:	LOW (TW) AND LEVEL (TW) TS : LOW#LEVEL : OR : LOW#LEVEL : (AB)
BRS:	LOW ADJ LEVEL
DIALOG	S LOW(W)LEVEL

Figure 17

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PRINTED AUTHORITY LIST

RELATIONSHIP SECTION

Personnel/ — (cont'd)
R Medical Personnel
Mental Health Personnel
Military Veterans
Nonprofessional Personnel/
Occupational Therapists
Occupations/
Paraprofessional Personnel
Personnel Management
Personnel Supply
Personnel Training
Physicists
Professional Personnel/
Psychologists
Religious Personnel
Retirement
Scientists/
Social Workers
Sociologists
Speech Therapists
Technical Personnel
Unemployment
Volunteer Personnel
Working Conditions

Perspective Taking
Use Role Taking

Perspiration
Use Sweat

Persuasion Therapy ^{73}
SN Limited directive therapy in which the client is encouraged to follow the therapist's advice to deal with current crisis.
B Psychotherapy

Persuasive Communication ^{67}
N Brainwashing
R Communication/

Pessimism ^{73}
SN Attitude characterized by a gloomy and desperate temperament and inclination to emphasize and expect the worst possible outcome of events and actions.
B Emotional States
Personality Traits
R Cynicism
Negativism

Pesticides
Use Insecticides

Petit Mal Epilepsy ^{73}
B Brain Disorders
Central Nervous System Disorders
Epilepsy
Nervous System Disorders

Pets ^{82}
SN Domesticated animals kept for pleasure rather than utility.
R Animals/

Petting ^{73}
B Psychosexual Behavior
R Sexual Intercourse (Human)
Social Dating

Peyote ^{73}
B Alkaloids
Hallucinogenic Drugs
Psychotomimetic Drugs

Peyote — (cont'd)
R Mescaline

Phantom Limbs ^{73}
B Body Image
Body Image Disturbances
R Amputation

Pharmacology ^{73}
B Paramedical Sciences
N Psychopharmacology

Pharmacotherapy
Use Drug Therapy

Pharyngeal Disorders ^{73}
B Respiratory Tract Disorders

Pharynx ^{73}
B Digestive System
Respiratory System

Phenaglycodol ^{73}
B Sedatives

Phencyclidine ^{82}
SN Piperadine having hallucinogenic, anesthetic, and analgesic properties.
UF PCP
B Analgesic Drugs
Anesthetic Drugs
Hallucinogenic Drugs

Phenelzine ^{73}
B Antidepressant Drugs
Monoamine Oxidase Inhibitors

Pheniprazine ^{73}
B Antidepressant Drugs

Phenmetrazine ^{73}
B Amines
Appetite Depressing Drugs
Sympathomimetic Amines
Sympathomimetic Drugs

Phenobarbital ^{73}
B Anticonvulsive Drugs
Barbiturates
Hypnotic Drugs
Sedatives

Phenomena (Parapsychological)
Use Parapsychological Phenomena

Phenomenology ^{67}
R History of Psychology

Phenothiazine Derivatives ^{73}
B Neuroleptic Drugs
Tranquilizing Drugs
N Butyrylperazine
Chlorpromazine
Chlorprothixene
Fluphenazine
Mesoridazine
Perphenazine
Prochlorperazine
Promazine
Thioridazine

Phenothiazine Derivatives — (cont'd)
N Trifluoperazine
Triflupromazine
R Cholinergic Blocking Drugs

Phenotypes ^{73}
R Genetics/
Genotypes

Phenoxybenzamine ^{73}
B Adrenergic Blocking Drugs
Amines
Antihypertensive Drugs

Phenylalanine ^{73}
B Acids
Alanines
Amino Acids

Phenylketonuria ^{73}
UF Oligophrenia (Phenylpyruvic)
PKU (Hereditary Disorder)
B Genetic Disorders
Metabolism Disorders
Neonatal Disorders
R Mental Retardation

Pheromones ^{73}
R Animal Mating Behavior
Glands
Hormones

Phi Coefficient ^{73}
UF Coefficient (Phi)
B Statistical Correlation

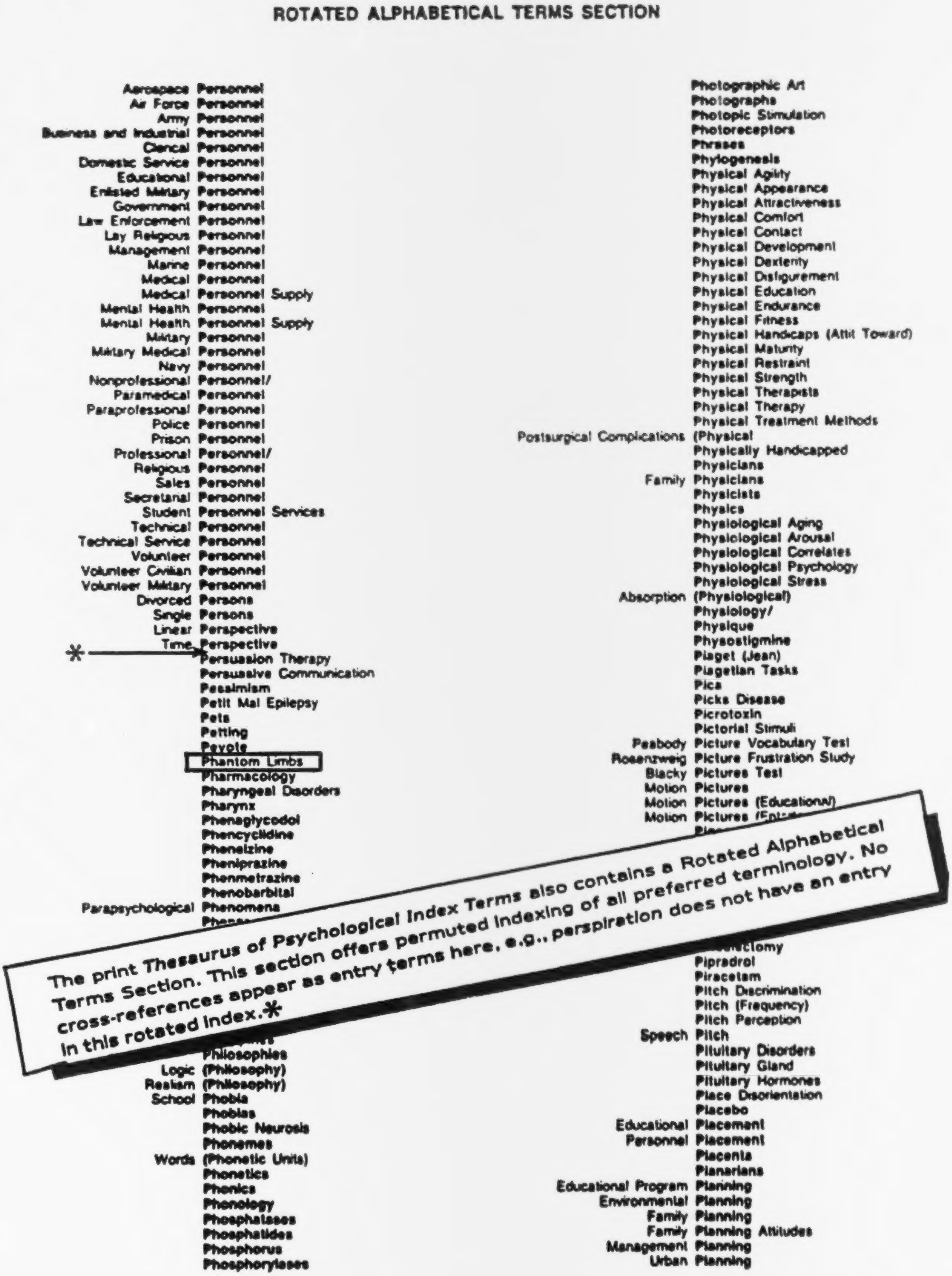
Philippines ^{73}
B Southeast Asia

Philosophies ^{67}
N Animism
Asceticism
Dualism
Epistemology
Existentialism
Fatalism
Humanism
Idealism
Intellectualism
Logic (Philosophy)
Materialism
Metaphysics
Mysticism
Nihilism
Pacifism
Pragmatism
Realism (Philosophy)
Reductionism
R Hedonism

Phobias ^{67}
N Acrophobia
Agoraphobia
Claustrophobia
Dysmorphophobia
Ophidiophobia
School Phobia
R Fear
Mental Disorders/
Phobic Neurosis

Phobic Neurosis ^{73}
B Neurosis

Figure 18



ROTATED ALPHABETICAL TERMS SECTION

Aerospace Personnel
Air Force Personnel
Army Personnel
Business and Industrial Personnel
Clerical Personnel
Domestic Service Personnel
Educational Personnel
Enlisted Military Personnel
Government Personnel
Law Enforcement Personnel
Lay Religious Personnel
Management Personnel
Marine Personnel
Medical Personnel
Medical Personnel Supply
Mental Health Personnel
Mental Health Personnel Supply
Military Personnel
Military Medical Personnel
Navy Personnel
Nonprofessional Personnel/
Paramedical Personnel
Paraprofessional Personnel
Police Personnel
Prison Personnel
Professional Personnel/
Religious Personnel
Sales Personnel
Secretarial Personnel
Student Personnel Services
Technical Personnel
Technical Service Personnel
Volunteer Personnel
Volunteer Civilian Personnel
Volunteer Military Personnel
Divorced Persons
Single Persons
Linear Perspective
Time Perspective
* Persuasion Therapy
Persuasive Communication
Pessimism
Petit Mal Epilepsy
Pets
Petting
Peyote
Phantom Limbs
Pharmacology
Pharyngeal Disorders
Pharynx
Phenaglycodol
Phencyclidine
Phenelzine
Pheniprazine
Phenmetrazine
Phenobarbital
Parapsychological Phenomena
Philosophies
Logic (Philosophy)
Realism (Philosophy)
School Phobia
Phobias
Phobic Neurosis
Phonemes
Words (Phonetic Units)
Phonetics
Phonics
Phonology
Phosphatases
Phosphatides
Phosphorus
Phosphorylases

Photographic Art
Photographs
Photopic Stimulation
Photoreceptors
Phrases
Phylogenesis
Physical Agility
Physical Appearance
Physical Attractiveness
Physical Comfort
Physical Contact
Physical Development
Physical Dexterity
Physical Disfigurement
Physical Education
Physical Endurance
Physical Fitness
Physical Handicaps (Attit Toward)
Physical Maturity
Physical Restraint
Physical Strength
Physical Therapists
Physical Therapy
Physical Treatment Methods
Postsurgical Complications (Physical
Physically Handicapped
Physicians
Family Physicians
Physicists
Physics
Physiological Aging
Physiological Arousal
Physiological Correlates
Physiological Psychology
Physiological Stress
Absorption (Physiological)
Physiology/
Physique
Physostigmine
Piaget (Jean)
Piagetian Tasks
Pica
Picks Disease
Picrotoxin
Pictorial Stimuli
Peabody Picture Vocabulary Test
Rosenzweig Picture Frustration Study
Blacky Pictures Test
Motion Pictures
Motion Pictures (Educational)
Motion Pictures (Ent
Pipradrol
Piracetam
Pitch Discrimination
Pitch (Frequency)
Pitch Perception
Speech Pitch
Pituitary Disorders
Pituitary Gland
Pituitary Hormones
Place Disorientation
Placebo
Educational Placement
Personnel Placement
Placenta
Planarians
Educational Program Planning
Environmental Planning
Family Planning
Family Planning Attitudes
Management Planning
Urban Planning

The print *Thesaurus of Psychological Index Terms* also contains a Rotated Alphabetical Terms Section. This section offers permuted indexing of all preferred terminology. No cross-references appear as entry terms here, e.g., perspiration does not have an entry in this rotated index.*

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Figure 19

Excerpt from DIALOG's Online Thesaurus

The PSYCINFOThesaurus is available online in DIALOG. In the examples below phantom limbs, body image, and body image disturbances are all shown to have related terms (RT) in the EXPAND display. In each case, the searcher may view these lists of related terms by further EXPANDing line numbers from the display (A), and thus access the same information available in the printed thesaurus Relationship section. One advantage of using the online thesaurus is that one or more related terms may be selected from the EXPAND display by line number rather than be typed out in full (B)

```
          ? E BODY IMAGE
     (C)  REF ITEMS  INDEX-TERM
          E1      47  BODY FLUIDS
          E2      93  BODY HEIGHT
          E3     597 *BODY IMAGE
          E4      79  BODY IMAGE DISTURBANCES
          E5     127  BODY LANGUAGE
          E6      32  BODY ROCKING
          E7       7  BODY SWAY TESTING
          E8     461  BODY TEMPERATURE
          E9          BODY TYPES
          E10   1376  BODY WEIGHT
          E11      1  BODY BUILDERS
          E12      1  BODYING
```

```
          ? E E3
          REF ITEMS   INDEX-TERM                  TYPE RT
     (A)  R1     597   BODY IMAGE                         3
          R2      79   BODY IMAGE DISTURBANCES       N  5
          R3           IMAGE (BODY)                  F  1
          R4      13   PHANTOM LIMBS                 N  3
```

```
          ? SS R1 OR R4
     (B)                 1   597 BODY IMAGE
                         2    13 PHANATOM LIMBS
                         3   610   1 or 2
```

Figure 20

Online Rotated Thesaurus on DIALOG

```
? E ZZ=IMAGE
REF ITEMS   INDEX-TERM
E1   1425   ZZ=ILLUSIONS
E2   1265   ZZ=ILLUSIONS
              (PERCEPTION)
E3   4158  *ZZ=IMAGE
E4     79   ZZ=IMAGE DISTURBANCES//
              BODY
E5    597   ZZ=IMAGE// BODY
E6    241   ZZ=IMAGE// RETINAL
E7   2799   ZZ=IMAGERY
E8    106   ZZ=IMAGERY//  CONCEPTUAL
E9     48   ZZ=IMAGERY//  EIDETIC
E10    12   ZZ=IMAGERY//  SPATIAL

                                 -MORE-

? SS E4
            4      79 ZZ=IMAGE DISTURBANCES// BODY
```

Figure 21 shows the difference in sequence of the individual fields within Comprehensive Dissertation Index records, again from Orbit, Dialog, and BRS. They don't follow the same sequence at all.

Conclusion

We've finished with the online services as they have existed in the last twenty years. Two factors provide incentives for making system design changes. Systems are getting closer in terms of features because of publishers (information suppliers/providers). Both groups are quick to realize that there are good features on other systems, and they force the reference utilities to adopt them. The reason that that works well is because there's a closed user group. That's not the case with the patrons that you're dealing with. So my question is, what is the catalyst for online public access catalogs? Are users strong enough and are they constant enough to force a good design? I'm not sure. That's something that you'll probably have to answer.

Finally, I'd like to go over a couple of end user applications. One you may be aware of is ISI's SCIMATE™. Figure 22 is a browsing display.[9] Figure 23, "Searching ISI Databases," is really just a flowchart, not so much to show people how complex things are but to keep them from getting lost in the menu screens. Users would stop and say "Where am I?" So the designers thought, "Maybe we'll number the menu screens." If users stop, they can look back at this display and find out where they are and go backwards or forwards from there.

Figure 24 is an example of the menu screen that's used by SCIMATE. The menu screen itself is no big deal; the interesting thing is that they allow three levels of searching. The first level is just searching as you would on a dumb terminal, so you can dial into anything, including Dow Jones, etc. The second level, which is a little bit smarter, allows you to deal with five hosts: Dialog, NLM, BRS, SDC, ISI. You're prompted and you are given a few menu screens. The top level deals with all of the ISI databases, such as SCISEARCH (Science Citation Index) and allows you to know almost nothing about searching. You don't need a lot of training.

Figure 21

SEQUENCE OF FIELDS

Full Record from ORBIT

```
AN  - ABD78-10372⑨
                                                                  ①
TI  - FACTORS THAT AFFECT THE DECISION TO REFER:  CONCEPTUAL LEVEL OF
      THE TEACHER AND SEX AND RACE OF THE ELEMENTARY SCHOOL STUDENT.
AU  - NEWMAN, WILLIAM LEE②
SO  - THE UNIVERSITY OF IOWA (IOWA), PH.D., 1977, 105 PP.④⑤⑥⑦
IS  - DISS. ABS. INTL., V39(1), SEC.A, P.132⑧
CC  - 519 (EDUCATION, GUIDANCE AND COUNSELING)③
```

Full Record from DIALOG

```
                         ⑨
196556  ORDER NO: AAD78-10372
                                                             ①
  FACTORS   THAT   AFFECT   THE   DECISION   TO REFER:   CONCEPTUAL LEVEL OF THE
TEACHER AND SEX AND RACE OF THE ELEMENTARY SCHOOL STUDENT.  105 PAGES.⑦
②NEWMAN, WILLIAM LEE  (PH.D.  1977  THE UNIVERSITY OF IOWA).④⑤
  PAGE 132 IN VOLUME 39/01-A OF DISSERTATION ABSTRACTS INTERNATIONAL.
  EDUCATION, GUIDANCE AND COUNSELING                                ⑧
  DESCRIPTOR CODES: 0519 ③
  INSTITUTION CODE: 0096 ⑥
```

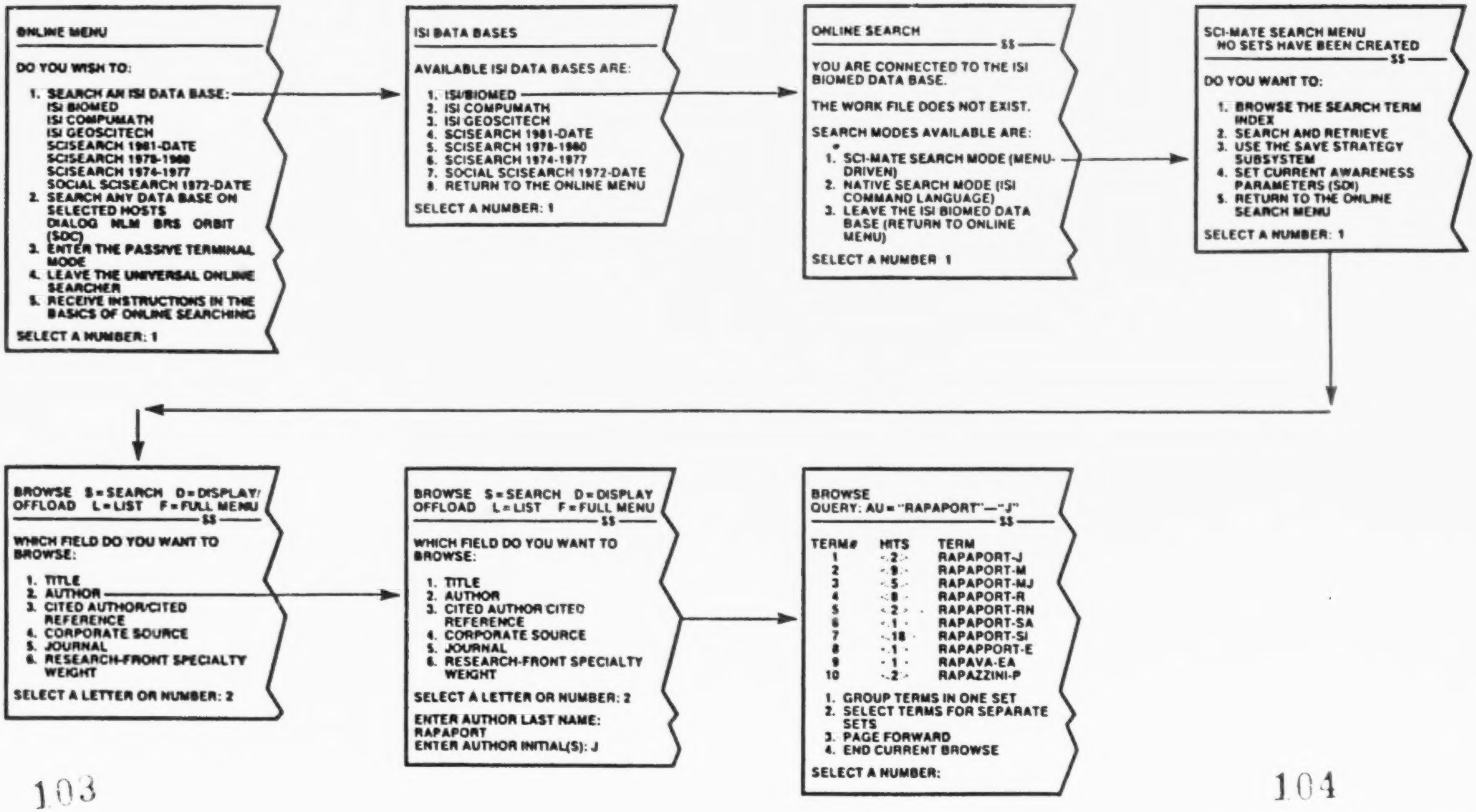
Full Record from BRS

```
 ADG78-10372.⑨
AU NEWMAN, WILLIAM LEE.②
IN THE UNIVERSITY OF IOWA (0096). PH.D. 1977, 105PP.④⑤⑥⑦       ①
TI FACTORS THAT AFFECT THE DECISION TO REFER: CONCEPTUAL LEVEL OF THE
HER AND SEX AND RACE OF THE ELEMENTARY SCHOOL STUDENT.
SO DAI V39(01), SEC A, P0132.⑧
YR 77.
DE EDUCATION, GUIDANCE AND COUNSELING (0519).③
```

Figure 22

BROWSING DISPLAY

II.2.B. BROWSING



```
ONLINE MENU
________________________________________

DO YOU WISH TO:

   1. SEARCH AN ISI DATA BASE:
      ISI BIOMED
      ISI COMPUMATH
      ISI GEOSCITECH
      SCISEARCH 1981-DATE
      SCISEARCH 1978-1980
      SCISEARCH 1974-1977
      SOCIAL SCISEARCH 1972-DATE
   2. SEARCH ANY DATA BASE ON
      SELECTED HOSTS
      DIALOG   NLM   BRS   ORBIT
      (SDC)
   3. ENTER THE PASSIVE TERMINAL
      MODE
   4. LEAVE THE UNIVERSAL ONLINE
      SEARCHER
   5. RECEIVE INSTRUCTIONS IN THE
      BASICS OF ONLINE SEARCHING

SELECT A NUMBER: 1
```

```
ISI DATA BASES
________________________________________

AVAILABLE ISI DATA BASES ARE:

   1. ISI/BIOMED
   2. ISI COMPUMATH
   3. ISI GEOSCITECH
   4. SCISEARCH 1981-DATE
   5. SCISEARCH 1978-1980
   6. SCISEARCH 1974-1977
   7. SOCIAL SCISEARCH 1972-DATE
   8. RETURN TO THE ONLINE MENU

SELECT A NUMBER: 1
```

```
ONLINE SEARCH
________________________________ $$ _____

YOU ARE CONNECTED TO THE ISI
BIOMED DATA BASE.

THE WORK FILE DOES NOT EXIST.

SEARCH MODES AVAILABLE ARE:

   1. SCI-MATE SEARCH MODE (MENU-
      DRIVEN)
   2. NATIVE SEARCH MODE (ISI
      COMMAND LANGUAGE)
   3. LEAVE THE ISI BIOMED DATA
      BASE (RETURN TO ONLINE
      MENU)

SELECT A NUMBER  1
```

```
SCI-MATE SEARCH MENU
   NO SETS HAVE BEEN CREATED
________________________________ $$ _____

DO YOU WANT TO:

   1. BROWSE THE SEARCH TERM
      INDEX
   2. SEARCH AND RETRIEVE
   3. USE THE SAVE STRATEGY
      SUBSYSTEM
   4. SET CURRENT AWARENESS
      PARAMETERS (SDI)
   5. RETURN TO THE ONLINE
      SEARCH MENU

SELECT A NUMBER: 1
```

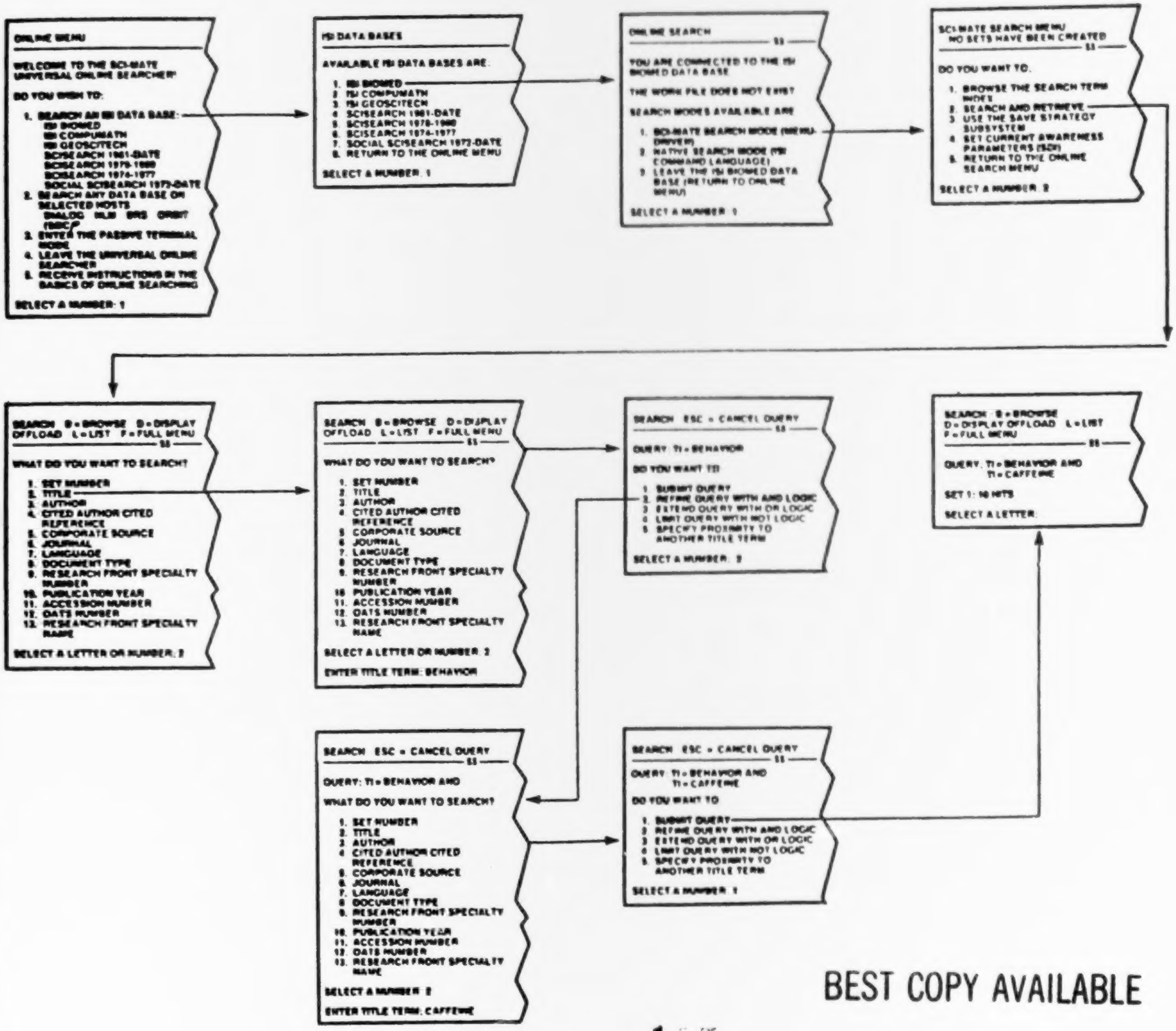
```
BROWSE   S=SEARCH   D=DISPLAY/
OFFLOAD   L=LIST   F=FULL MENU
________________________________ $$ _____

WHICH FIELD DO YOU WANT TO
BROWSE:

   1. TITLE
   2. AUTHOR
   3. CITED AUTHOR/CITED
      REFERENCE
   4. CORPORATE SOURCE
   5. JOURNAL
   6. RESEARCH-FRONT SPECIALTY
      WEIGHT

SELECT A LETTER OR NUMBER: 2
```

```
BROWSE   S=SEARCH   D=DISPLAY
OFFLOAD   L=LIST   F=FULL MENU
________________________________ $$ _____

WHICH FIELD DO YOU WANT TO
BROWSE:

   1. TITLE
   2. AUTHOR
   3. CITED AUTHOR CITED
      REFERENCE
   4. CORPORATE SOURCE
   5. JOURNAL
   6. RESEARCH-FRONT SPECIALTY
      WEIGHT

SELECT A LETTER OR NUMBER: 2

ENTER AUTHOR LAST NAME:
RAPAPORT
ENTER AUTHOR INITIAL(S): J
```

```
BROWSE
QUERY: AU="RAPAPORT"—"J"
________________________________ $$ _____

TERM#    HITS    TERM
   1       2     RAPAPORT-J
   2       9     RAPAPORT-M
   3       5     RAPAPORT-MJ
   4       8     RAPAPORT-R
   5       2     RAPAPORT-RN
   6       1     RAPAPORT-SA
   7      18     RAPAPORT-SI
   8       1     RAPAPPORT-E
   9       1     RAPAVA-EA
  10       2     RAPAZZINI-P

   1. GROUP TERMS IN ONE SET
   2. SELECT TERMS FOR SEPARATE
      SETS
   3. PAGE FORWARD
   4. END CURRENT BROWSE

SELECT A NUMBER:
```

Figure 23

II.2.C. SEARCHING ISI DATABASES



```
ONLINE MENU

WELCOME TO THE SCI-MATE
UNIVERSAL ONLINE SEARCHER!

DO YOU WISH TO:

  1. SEARCH AN ISI DATA BASE:
       ISI BIOMED
       ISI COMPUMATH
       ISI GEOSCITECH
       SCISEARCH 1981-DATE
       SCISEARCH 1978-1980
       SCISEARCH 1974-1977
       SOCIAL SCISEARCH 1972-DATE
  2. SEARCH ANY DATA BASE ON
     SELECTED HOSTS
       DIALOG  NLM  BRS  ORBIT
       (SDC)
  3. ENTER THE PASSIVE TERMINAL
     MODE
  4. LEAVE THE UNIVERSAL ONLINE
     SEARCHER
  5. RECEIVE INSTRUCTIONS IN THE
     BASICS OF ONLINE SEARCHING

SELECT A NUMBER: 1
```

```
ISI DATA BASES

AVAILABLE ISI DATA BASES ARE:

  1. ISI BIOMED
  2. ISI COMPUMATH
  3. ISI GEOSCITECH
  4. SCISEARCH 1981-DATE
  5. SCISEARCH 1978-1980
  6. SCISEARCH 1974-1977
  7. SOCIAL SCISEARCH 1972-DATE
  8. RETURN TO THE ONLINE MENU

SELECT A NUMBER: 1
```

```
ONLINE SEARCH
                              $$

YOU ARE CONNECTED TO THE ISI
BIOMED DATA BASE

THE WORK FILE DOES NOT EXIST

SEARCH MODES AVAILABLE ARE

  1. SCI-MATE SEARCH MODE (MENU-
     DRIVEN)
  2. NATIVE SEARCH MODE (ISI
     COMMAND LANGUAGE)
  3. LEAVE THE ISI BIOMED DATA
     BASE (RETURN TO ONLINE
     MENU)

SELECT A NUMBER: 1
```

```
SCI-MATE SEARCH MENU
  NO SETS HAVE BEEN CREATED
                              $$

DO YOU WANT TO:

  1. BROWSE THE SEARCH TERM
     INDEX
  2. SEARCH AND RETRIEVE
  3. USE THE SAVE STRATEGY
     SUBSYSTEM
  4. SET CURRENT AWARENESS
     PARAMETERS (SDI)
  5. RETURN TO THE ONLINE
     SEARCH MENU

SELECT A NUMBER: 2
```

```
SEARCH  B=BROWSE  D=DISPLAY
OFFLOAD  L=LIST  F=FULL MENU
                              $$

WHAT DO YOU WANT TO SEARCH?

   1. SET NUMBER
   2. TITLE
   3. AUTHOR
   4. CITED AUTHOR CITED
      REFERENCE
   5. CORPORATE SOURCE
   6. JOURNAL
   7. LANGUAGE
   8. DOCUMENT TYPE
   9. RESEARCH FRONT SPECIALTY
      NUMBER
  10. PUBLICATION YEAR
  11. ACCESSION NUMBER
  12. OATS NUMBER
  13. RESEARCH FRONT SPECIALTY
      NAME

SELECT A LETTER OR NUMBER: 2
```

```
SEARCH  B=BROWSE  D=DISPLAY
OFFLOAD  L=LIST  F=FULL MENU
                              $$

WHAT DO YOU WANT TO SEARCH?

   1. SET NUMBER
   2. TITLE
   3. AUTHOR
   4. CITED AUTHOR CITED
      REFERENCE
   5. CORPORATE SOURCE
   6. JOURNAL
   7. LANGUAGE
   8. DOCUMENT TYPE
   9. RESEARCH FRONT SPECIALTY
      NUMBER
  10. PUBLICATION YEAR
  11. ACCESSION NUMBER
  12. OATS NUMBER
  13. RESEARCH FRONT SPECIALTY
      NAME

SELECT A LETTER OR NUMBER: 2

ENTER TITLE TERM: BEHAVIOR
```

```
SEARCH  ESC = CANCEL QUERY
                              $$

QUERY: TI=BEHAVIOR

DO YOU WANT TO

  1. SUBMIT QUERY
  2. REFINE QUERY WITH AND LOGIC
  3. EXTEND QUERY WITH OR LOGIC
  4. LIMIT QUERY WITH NOT LOGIC
  5. SPECIFY PROXIMITY TO
     ANOTHER TITLE TERM

SELECT A NUMBER: 2
```

```
SEARCH  ESC = CANCEL QUERY
                              $$

QUERY: TI=BEHAVIOR AND

WHAT DO YOU WANT TO SEARCH?

   1. SET NUMBER
   2. TITLE
   3. AUTHOR
   4. CITED AUTHOR CITED
      REFERENCE
   5. CORPORATE SOURCE
   6. JOURNAL
   7. LANGUAGE
   8. DOCUMENT TYPE
   9. RESEARCH FRONT SPECIALTY
      NUMBER
  10. PUBLICATION YEAR
  11. ACCESSION NUMBER
  12. OATS NUMBER
  13. RESEARCH FRONT SPECIALTY
      NAME

SELECT A NUMBER: 2

ENTER TITLE TERM: CAFFEINE
```

```
SEARCH  ESC = CANCEL QUERY
                              $$

QUERY: TI=BEHAVIOR AND
       TI=CAFFEINE

DO YOU WANT TO

  1. SUBMIT QUERY
  2. REFINE QUERY WITH AND LOGIC
  3. EXTEND QUERY WITH OR LOGIC
  4. LIMIT QUERY WITH NOT LOGIC
  5. SPECIFY PROXIMITY TO
     ANOTHER TITLE TERM

SELECT A NUMBER: 1
```

```
SEARCH  B=BROWSE
D=DISPLAY OFFLOAD  L=LIST
F=FULL MENU
                              $$

QUERY: TI=BEHAVIOR AND
       TI=CAFFEINE

SET 1: 10 HITS

SELECT A LETTER:
```

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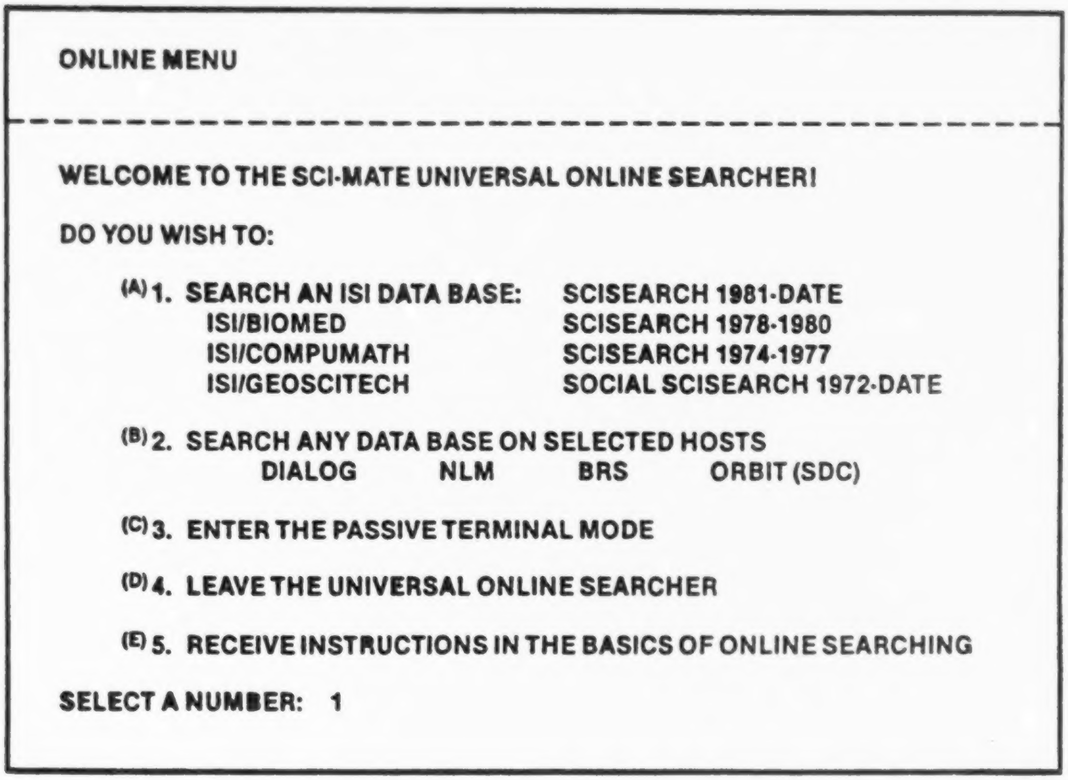
Figure 24

MENU SCREEN



```
ONLINE MENU
------------------------------------------------------------------

WELCOME TO THE SCI-MATE UNIVERSAL ONLINE SEARCHER!

DO YOU WISH TO:

   (A) 1. SEARCH AN ISI DATA BASE:    SCISEARCH 1981-DATE
            ISI/BIOMED                SCISEARCH 1978-1980
            ISI/COMPUMATH             SCISEARCH 1974-1977
            ISI/GEOSCITECH            SOCIAL SCISEARCH 1972-DATE

   (B) 2. SEARCH ANY DATA BASE ON SELECTED HOSTS
                DIALOG       NLM        BRS       ORBIT (SDC)

   (C) 3. ENTER THE PASSIVE TERMINAL MODE

   (D) 4. LEAVE THE UNIVERSAL ONLINE SEARCHER

   (E) 5. RECEIVE INSTRUCTIONS IN THE BASICS OF ONLINE SEARCHING

SELECT A NUMBER:  1
```

Figure 25 shows how you might go about selecting an ISI database.

In the next example (see Figure 26) notice those little dollar signs--they're really important. They're not put up there to tell people that this is or isn't an expensive system but to remind them that there are times when they are offline compiling a search, and there are other times when they are online (i.e., paying). They'd better be aware of that distinction so that they don't just dawdle at their desks, which is a very common situation when you're dealing with a micro-based system.

I think we'll go on to KNOWLEDGE INDEX (see Figure 27) and BRS AFTER DARK.[10] This slide shows a sample search on KI. By the way, BRS AFTER DARK started out as a menu based system and changed within about a year to being a command based system, or rather a mix of menus and commands. The more frequent searchers' suggestions were what were listened to. After a while people got bored and impatient with the menus. KNOWLEDGE INDEX started out with a much simpler command set, not ever going to menus. Their displays are simple; you can ask for a short, medium, or long record instead of one of nine formats that regular Dialog has. In BRS's case there is a custom format you build yourself.

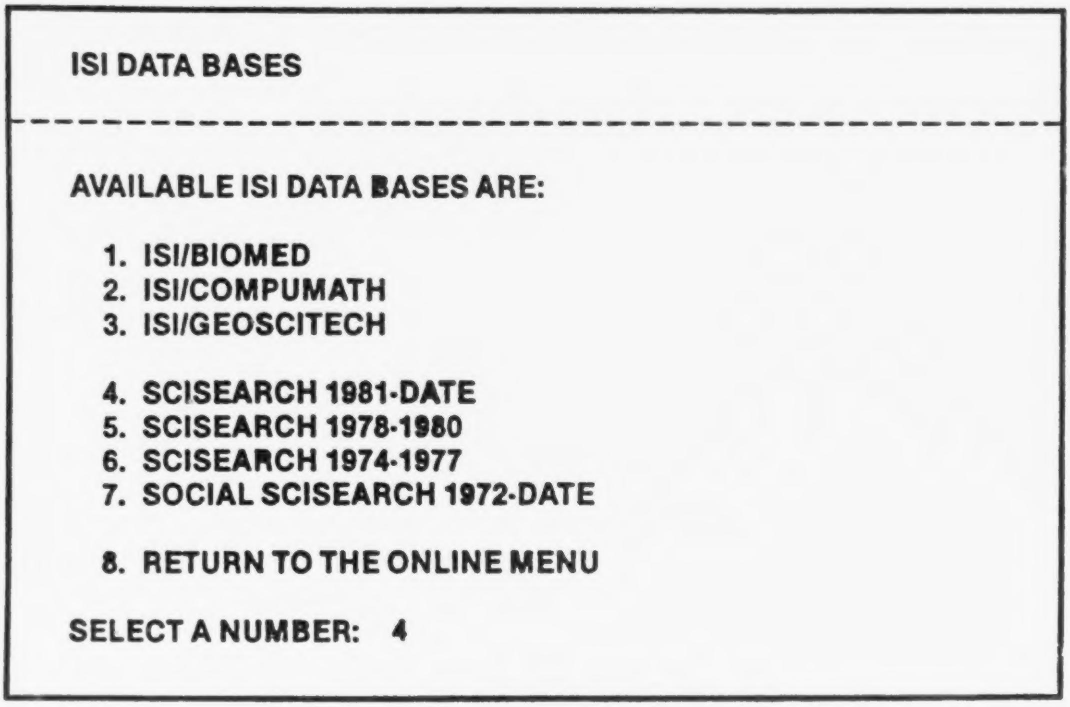
Figure 28 is IN-SEARCH.[11] This shows the windowing capabilities that you have with microcomputer-based systems. You don't have just one set of information on the screen but a number of things, nicely blocked off.

Another "friendly" system is KAware,[12] where you just press a space bar and travel down a menu of choices. The user no longer works with a command language. You work by pointing. That's a real improvement. I show these as examples of what can be provided via a microcomputer system.

Figure 29 shows the different fields that are available for searching in Microcomputer Index. Again, it's a "point to" selection. Once you get the caret to the right level it automatically selects what you want.

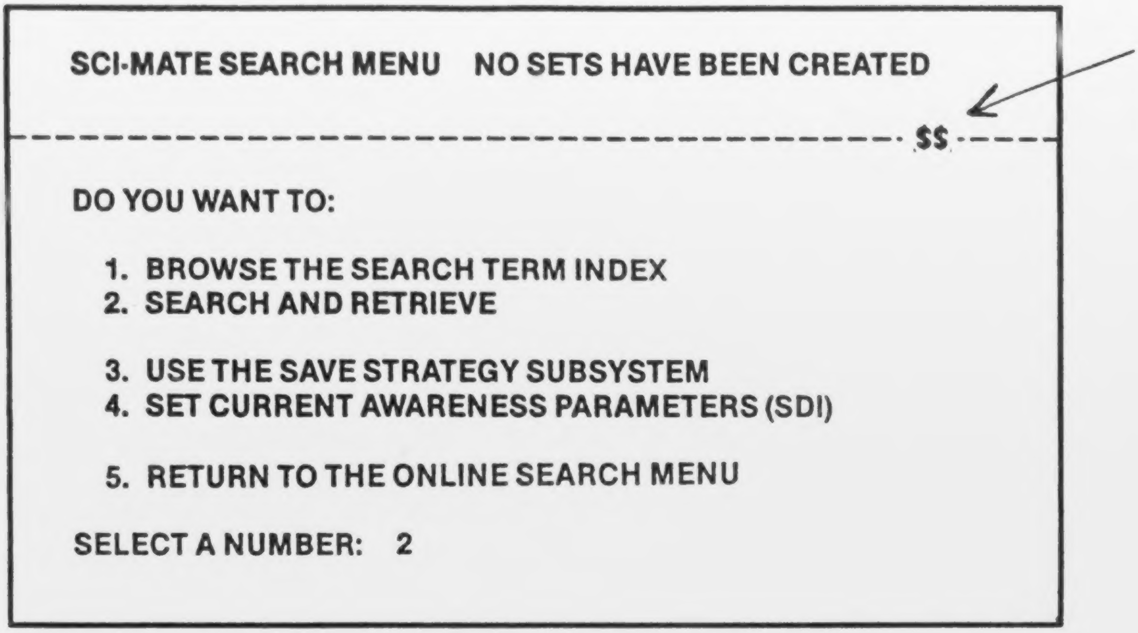
Figure 30 is a "semi-windowing" display, where you have a whole bunch of information on one screen. You are always provided with a recap of whatever you have searched for. Also, at the bottom it shows you, in yellow and black, what your limits are and how close you are to those limits.

Figure 25



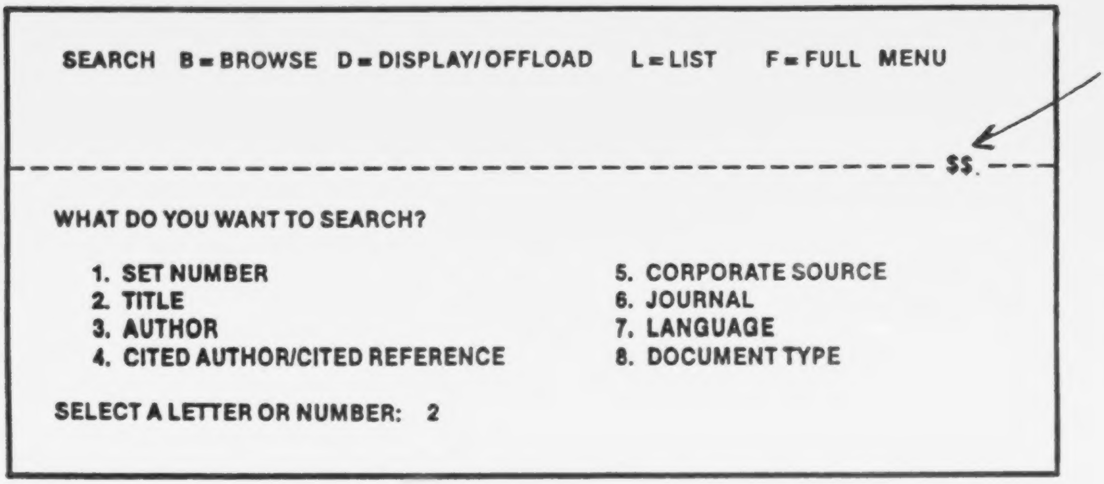
```
ISI DATA BASES
------------------------------------------------------------
AVAILABLE ISI DATA BASES ARE:

   1. ISI/BIOMED
   2. ISI/COMPUMATH
   3. ISI/GEOSCITECH

   4. SCISEARCH 1981-DATE
   5. SCISEARCH 1978-1980
   6. SCISEARCH 1974-1977
   7. SOCIAL SCISEARCH 1972-DATE

   8. RETURN TO THE ONLINE MENU

SELECT A NUMBER:   4
```

Figure 26



```
SCI-MATE SEARCH MENU    NO SETS HAVE BEEN CREATED

----------------------------------------------------- $$ ----

DO YOU WANT TO:

   1. BROWSE THE SEARCH TERM INDEX
   2. SEARCH AND RETRIEVE

   3. USE THE SAVE STRATEGY SUBSYSTEM
   4. SET CURRENT AWARENESS PARAMETERS (SDI)

   5. RETURN TO THE ONLINE SEARCH MENU

SELECT A NUMBER:    2
```

After you choose to search the database, Sci-Mate asks you which field you want to search. In other words, you need to tell Sci-Mate where to look within a record to find a search term; a record will be retrieved only if the term is found in the field you specify. The searchable fields in SOCIAL SCISEARCH are then displayed on the next screen:



```
SEARCH   B = BROWSE  D = DISPLAY/OFFLOAD    L = LIST     F = FULL  MENU


------------------------------------------------------------ $$ ---

WHAT DO YOU WANT TO SEARCH?

   1. SET NUMBER                              5. CORPORATE SOURCE
   2. TITLE                                   6. JOURNAL
   3. AUTHOR                                  7. LANGUAGE
   4. CITED AUTHOR/CITED REFERENCE            8. DOCUMENT TYPE

SELECT A LETTER OR NUMBER:   2
```

Figure 27

```
① ?BEGIN BUSI
  11/11/82  16:24:06 EST
  Now in BUSINESS INFORMATION (BUSI) Section
    ABI/Inform (BUSI1) Database
     (Copyright 1982 Data Courier Inc.)
```

① *BEGIN in a section using the first four letters of the section name (the space after the word BEGIN is necessary).*

```
② ?FIND INVESTMENTS AND GENETIC AND TECHNOLOGY
                       12152 INVESTMENTS
                         143 GENETIC
                       10346 TECHNOLOGY
                  S1       5 INVESTMENTS AND GENETIC AND TECHNOLOGY
```

② *FIND search topic using key words joined with AND.*

```
③ ?DISPLAY S1
                      Display 1/L/1
  82008564   ID No: 82008564
    Avoiding the Bio Bubbles
    Sloan, Allan
    Money   v11n3    59,60,62    Mar  1982   Coden:   MNEYAB  ISSN
  0149-4953  Jrnl Code: MON
    Availability: Money,  Time & Life Bldg.,  Rockefeller Center,
  New York, NY 10020
    Doc Type: JOURNAL PAPER
    Biotechnology  may  be  the  wave of the future,  but for now,
  prices  have  been  driven  up  on  these  companies'   stocks.
  Biotechnology's  area of greatest promise is in recombining DNA,
  i.e., taking genetic material from one microorganism and putting
  it into another to create an entirely new microbe.   Among  the
  research   projects  being  conducted  are  the  development  of
  interferon and exploring new  ways  of  creating  insulin.   An
  overview  of some of the biotechnology firms is presented.  One
  way to cash in on  the  biotech  play  is  to  invest  in  giant
  companies, such as Dow and Monsanto,  which are more stable,  or
  in companies which  supply  equipment  to  biotech  researchers.
  Small,  biotech research and development  (R & D)  companies are
  the riskiest plays.  Biotechnology Investments, a mutual fund in
  this field,  is another possibility.   The  best  time  to  buy
  biotechnology stocks may be after a shakeout occurs.
    Descriptors: Genetic engineering; Bio; Technology; Investment;
  Strategy; Portfolio investments
```

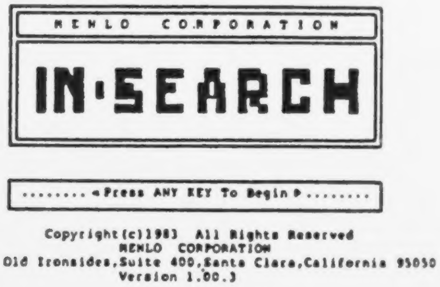
③ *DISPLAY results.*

Figure 28

IN-SEARCH

The In-Search Startup Screen

After you start the program using one of the preceding methods, the following screen appears:


MENLO CORPORATION

IN·SEARCH

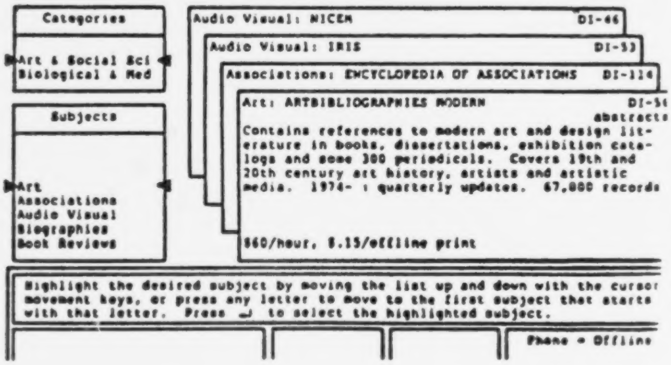
........◄Press ANY KEY To Begin►........

Copyright(c)1983 All Rights Reserved
MENLO CORPORATION
4633 Old Ironsides,Suite 400,Santa Clara,California 95050
Version 1.00.3

This startup screen displays copyright information for In-Search.

The Database Selection Screen

When you're ready to begin the first tutorial, press any character key on your keyboard. After a few seconds, the Database Selection screen appears.


Categories
Art & Social Sci
Biological & Med
Subjects
Art
Associations
Audio Visual
Biographies
Book Reviews
Audio Visual: NICEM DI-46
Audio Visual: IRIS DI-33
Associations: ENCYCLOPEDIA OF ASSOCIATIONS DI-114
Art: ARTBIBLIOGRAPHIES MODERN DI-5
abstract
Phone = Offline

Contains references to modern art and design literature in books, dissertations, exhibition catalogs and some 300 periodicals. Covers 19th and 20th century art history, artists and artistic media. 1974- ; quarterly updates. 67,000 record

$60/hour, $.15/offline print

Highlight the desired subject by moving the list up and down with the curso movement keys, or press any letter to move to the first subject that starts with that letter. Press ↵ to select the highlighted subject.

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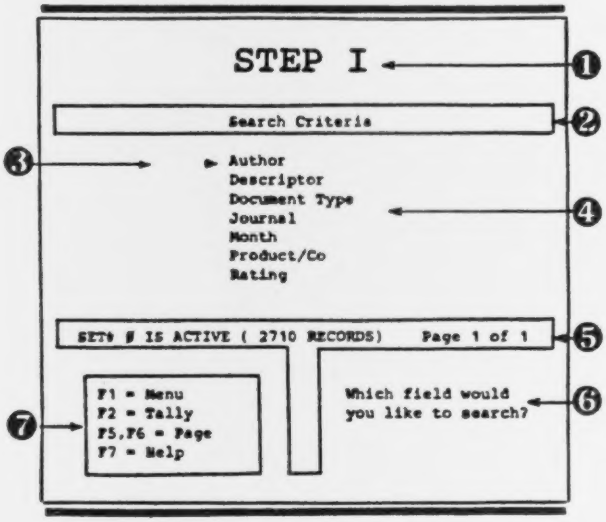
Figure 29

MICROREVIEWS

Screens

There are four main types of screens you'll come across during your use of **MicroReviews.**

- **The "Main Menu" Screen,** labelled STEP I, is the screen from which you begin a search.


STEP I
①
Search Criteria
②
③
► Author
Descriptor
Document Type
Journal
Month
Product/Co
Rating
④
⑤
⑥
⑦
F1 = Menu
F2 = Tally
F5,F6 = Page
F7 = Help

SET# 0 IS ACTIVE (2710 RECORDS) Page 1 of 1

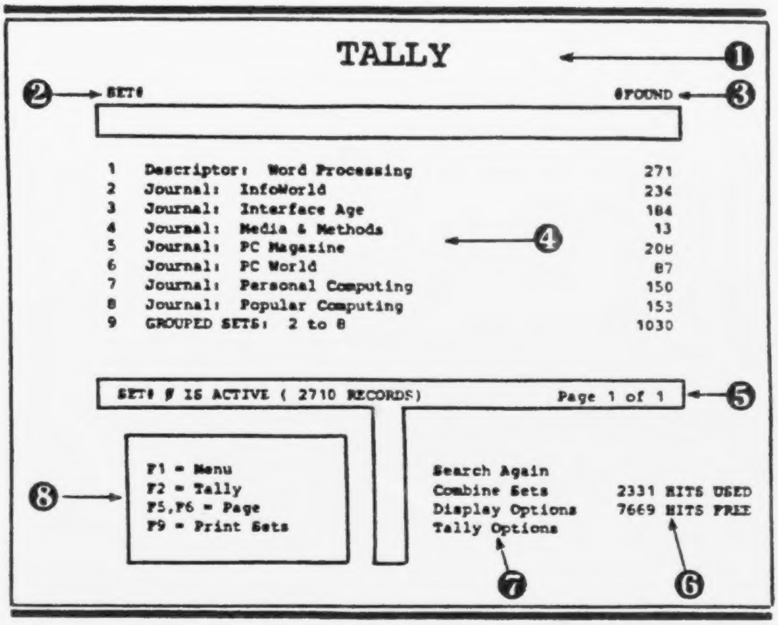
Which field would you like to search?

This screen, as do most search screens, has seven major areas of information or activity.

① General screen definition (e.g., STEP I, STEP II, STEP III, DISPLAY, TALLY, GRAPH, etc.)

112

Figure 30

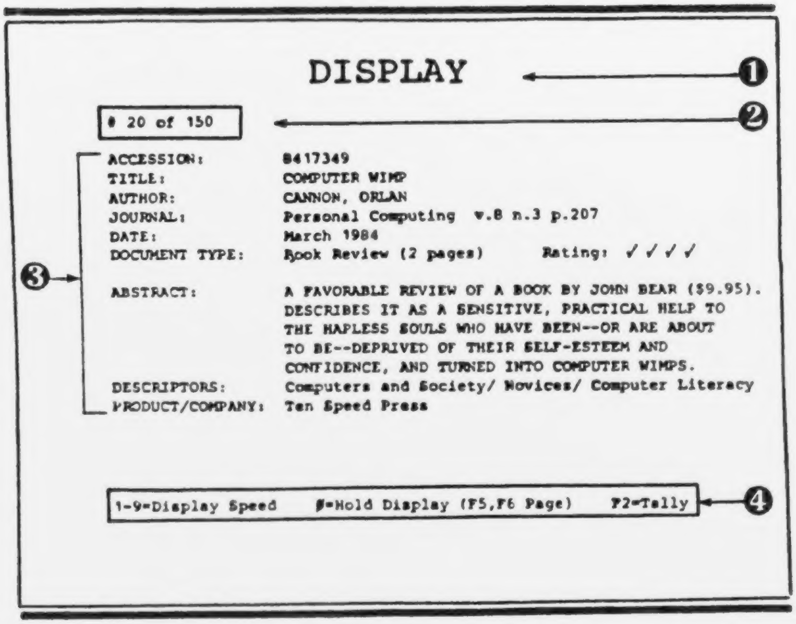


```
                         TALLY
SET#                                                  #FOUND

  1   Descriptor:  Word Processing                      271
  2   Journal:  InfoWorld                               234
  3   Journal:  Interface Age                           184
  4   Journal:  Media & Methods                          13
  5   Journal:  PC Magazine                             208
  6   Journal:  PC World                                 87
  7   Journal:  Personal Computing                      150
  8   Journal:  Popular Computing                       153
  9   GROUPED SETS:  2 to 8                            1030

 SET# # IS ACTIVE ( 2710 RECORDS)              Page 1 of 1

  F1 = Menu                  Search Again
  F2 = Tally                 Combine Sets       2331 HITS USED
  F5,F6 = Page               Display Options    7669 HITS FREE
  F9 = Print Sets            Tally Options
```

Figure 31 is just a record display. Each of the fields is labeled with the title, author, etc.

In conclusion, I think that during the next year or so a high priority activity would be to consult your user community with respect to display design. Good products are based on being in touch with your marketplace.

Figure 31



```
                         DISPLAY

 # 20 of 150

 ACCESSION:         8417349
 TITLE:             COMPUTER WIMP
 AUTHOR:            CANNON, ORLAN
 JOURNAL:           Personal Computing  v.8 n.3 p.207
 DATE:              March 1984
 DOCUMENT TYPE:     Book Review (2 pages)      Rating: ✓✓✓✓

 ABSTRACT:          A FAVORABLE REVIEW OF A BOOK BY JOHN BEAR ($9.95).
                    DESCRIBES IT AS A SENSITIVE, PRACTICAL HELP TO
                    THE HAPLESS SOULS WHO HAVE BEEN--OR ARE ABOUT
                    TO BE--DEPRIVED OF THEIR SELF-ESTEEM AND
                    CONFIDENCE, AND TURNED INTO COMPUTER WIMPS.
 DESCRIPTORS:       Computers and Society/ Novices/ Computer Literacy
 PRODUCT/COMPANY:   Ten Speed Press


 1-9=Display Speed    0=Hold Display (F5,F6 Page)    F2=Tally
```

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IV. CRITIQUE OF ONLINE DISPLAY SCREENS

Kent Norman

It was with great fear and trepidation that I accepted the invitation to critique the online catalogs on display at the conference. As a casual user of many different systems and as a researcher on human/computer interaction, I felt that it was more an opportunity to learn something myself than to give new insights about future directions for design. I come in part as a person representing the users and looking at systems from their perspective. What are the expectations of the user? What are users' preconceptions and misconceptions about the systems they see? I also came as a consultant on human/computer interaction with a number of questions about design. How do system designers instill those misconceptions? How can we help them to produce a truly useful, efficient, and satisfying system?

System design is an intensive effort. Designers work for years developing screen layouts and command structures. Man-years may go into the decisions that determine that for a given system, "part A goes here; part B goes there." At the same time, another design group may spend man-years developing software that says, "part B goes here and part A goes there." Which one is right? We really don't know. It could be a totally arbitrary decision. Unfortunately, we can't use an applause meter to declare the winner.

Currently, there is a cry for standards; but before standards come out, the best thing to do is to shake all our ideas as hard as we can, to prevent design from jelling into a less than optimal mold. Part of that shaking process is the anticipation of technological breakthroughs in system capabilities that are likely to occur in the near future. We also need to think about the probable sophistication of the patron in the future. Can we expect "computer literacy?" And if so, literacy in what language?

The human/computer interface is usually the last system component that designers think about. We tend to think about setting up the database first. Then we worry about how to write the code to manipulate the database. Then, at the very end, we think about command languages and how to get the user into the database. Given that approach, we should not be surprised when people meet our computers and it is not love at first sight.

I'd like to quote from the Bible (Ecclesiastes 12:12): "Of the writing of many books there is no end; And the reading thereof is a weariness of the flesh." I think it is also fair to say that "The online searching thereof is a weariness of the flesh." How can we overcome the interface problem? What are some of the key factors in screen design? The remainder of this presentation covers a number of issues that must be considered in the design of interactive systems.

Screen Organization and Layout

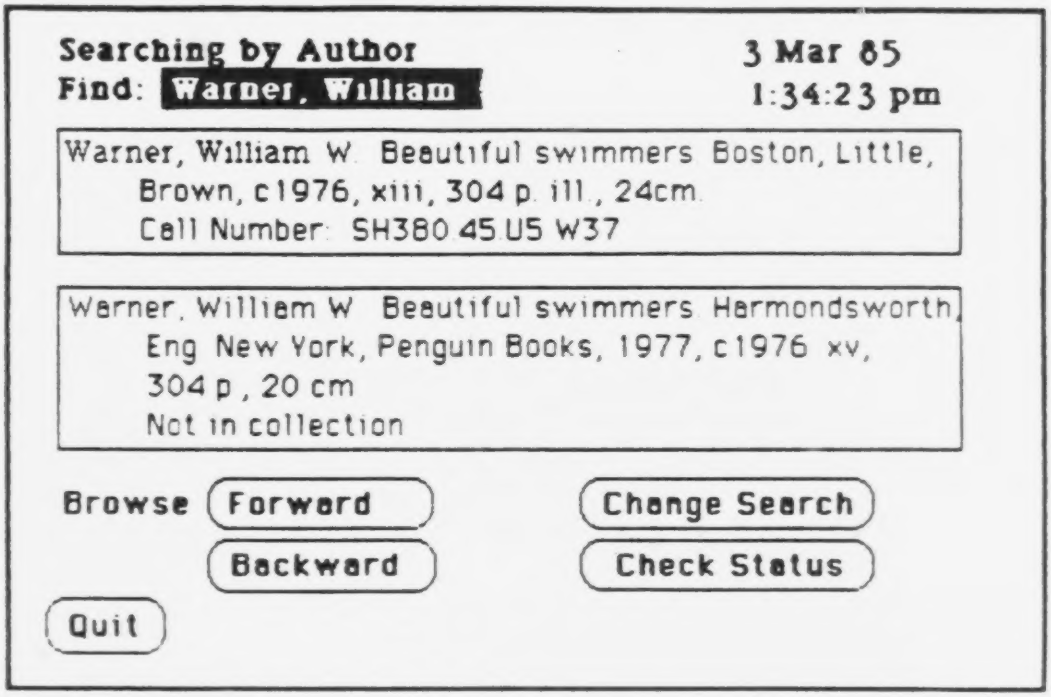
One of the first things to do in interface design is to determine what the user is looking for and where he expects it to be. One way to study this is to measure eye movements across the screen. Where are users looking? Where is the most likely place for them to check for information at a particular time in the search process?

In evaluating the systems demonstrated here at the conference, I looked for four different types of information in each display (see Figure 1). The first thing I looked for was search context information. Information that establishes a context in the process of searching should always be available. Since the user sees only one screen at a time, he needs to know which screen it is and where it falls in the search process. Searching is a sequential process; as the user steps from one phase to another, the system should help the user to change his viewpoint whenever necessary. The screen displayed in Figure 1 shows the search context at the upper left-hand corner; we see that this search is by author and that the current name being searched is Warner.

Figure 1

Some Factors to Look for in Screen Based Search

- Screen Organization/Layout



Searching by Author
Find: Warner, William

3 Mar 85
1:34:23 pm

Warner, William W. Beautiful swimmers. Boston, Little, Brown, c1976, xiii, 304 p. ill., 24cm.
Call Number: SH380.45.U5 W37

Warner, William W. Beautiful swimmers. Harmondsworth, Eng. New York, Penguin Books, 1977, c1976. xv, 304 p., 20 cm.
Not in collection

Browse
Forward
Backward
Change Search
Check Status
Quit

- Search Context Information
- Unrelated Information
- Target Information
- Action Information

How change is conveyed on the screen is also very important. In some cases, changes occur in a vertical manner, up and down across the same information--for example, when the system scrolls up and down through a file. Sometimes changes occur in the depth of search and proceed forward or backward or up or down within a menu structure. Changes due to depth of search can be very confusing to the user. Most online catalogs involve both vertical scanning of lists and depth of menus, and it is not uncommon for users to confuse the two types of change. One system demonstrated here used the command "PREVIOUS" to go to the "previous page." Does that mean to go browsing back up to the previous page of the index currently shown on the screen, or to go back to the previous frame or screen in the menu structure? It is not a simple task to give the user meaningful information about search context.

The second thing I looked for on screen displays was unrelated information. The software release number or the time of day are examples of the kinds of miscellaneous information that can be included in an online display. While such information is not always inherently bad, it may not be particularly good, either. It may be distracting and serve only to clutter up the screen. In other cases, it may be pertinent information--for example, that the library closes in five minutes. In Figure 1, the unrelated information is the time and date at the upper righthand corner. For some reason designers feel compelled to display the time and date, despite the fact that the computer has no monopoly on this information.

Third, I looked for target information. Target information helps users to decide whether what they've retrieved is really what they're looking for. It's not action information; it's viewing information. For example, in Figure 1, the target information is shown in the two boxes containing book citations. The user views this information to determine whether the search was or was not a success.

The last category I looked at is action information. The user will ask, "What can I do now? Where can I go? What is available to me?" In Figure 1 the action information is shown at the bottom of the screen. The user has control over the vertical search of the file by browsing forward or backward. Control over the depth of search is provided by the "Change Search," "Check Status," and "Quit" options.

We almost always see action information at the bottom of the screen. This is probably a holdover from the old teletype days when text only scrolled up. However, on computer terminals today the entry point of the command need not be at the bottom. We did a small study on the placement of action information with students in our lab. We gave two different screen configurations: one with the command entry point at the top and one at the bottom of the screen. Half of the sample tested were computer scientists. They preferred it at the bottom; they wanted to see output, then input. The other half of the sample were naive users who were psychology undergraduates. They preferred the input point to be at the top. Most systems are designed by sophisticated computer scientists, so the command entry point is at the bottom. One system that I saw yesterday had it at the top. However, on questioning, I found out that this was not a function of insightful design but rather that this innovative placement was a fluke; a hardware constraint had prevented the command entry point from being at the bottom.

Action information gives control to the user. Unfortunately, this aspect of online catalogs is the least developed. At one extreme, "user friendly" systems are often highly restrictive. Menus provide very little control and flexibility for the user. At the other extreme, "sophisticated" systems are very powerful, but do not adequately convey action information to users; they limit users who lack esoteric knowledge about the system design.

Screen-to-Screen Linkage

A second aspect of human/computer interaction that is really important to users is what I term the screen-to-screen linkage. Users need to know where they are, and should be able to move easily from one point to another. The linkage shows where I'm going and where I have come from. There are two types of linkage (see Figure 2). Verbal linkage relies on the memory of the user to know what he is doing. One standard that we have proposed for verbal linkage is that a subsequent menu title should be close to the exact wording of the option selected. If I select option A2 on the menu, A2 should now become the label of the next frame. That should occur each time I make a selection. A better approach, as long as we don't clutter up the screen, is to give a search history--a hierarchy of what the user has done. Unlike designers, users do not usually have a mental model of the hierarchy of menus or even a hierarchy of states when they are performing a search. Consequently, it is imperative that the system prompt the user in such a way as to remind him about where he is in the search process.

A greater sense of understanding and sense of control can be achieved if the system is able to instill a visual mental model of the menu structure and movement through it. Sometimes that can be done with spatial linking of one screen to another. An example of this is shown in the lower half of Figure 2. Spatial linking is frequently accomplished with overlapping windows. We really don't know yet if the overlapping window is very useful. It is possible that it might do more damage to the user because it adds to screen clutter.

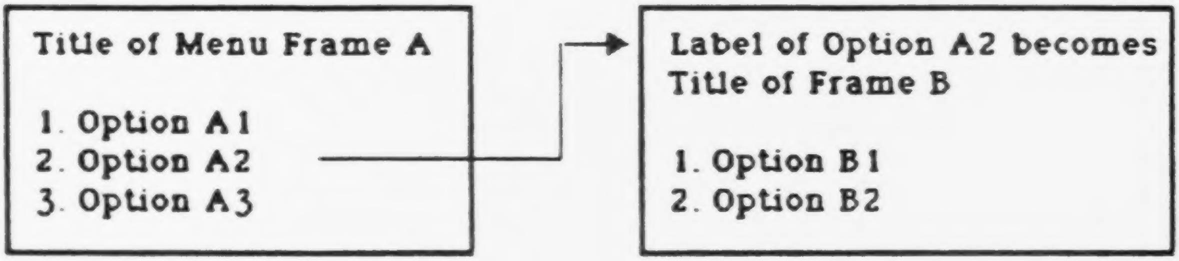
Screen-to-Screen Consistency

Screen-to-screen consistency in both terminology and location of elements in the display is extremely important (see Figure 3). The terminology that is used from one screen to the next should be the same. The worst thing to do to a user is to keep varying terms on him.

Figure 2

Some Factors to Look for in Screen Based Search

- Screen/Screen Linkage
  - Verbal Linkage:



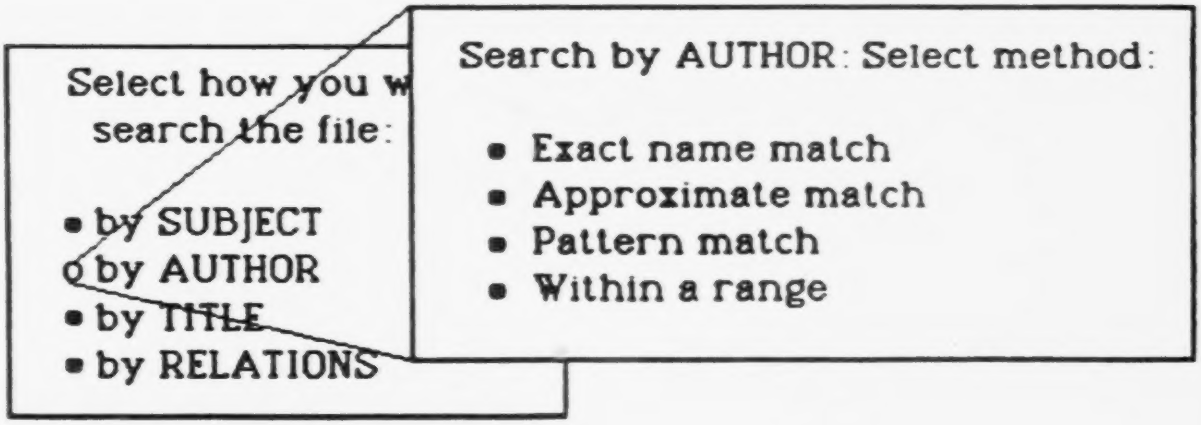
Title of Menu Frame A

1. Option A1
2. Option A2
3. Option A3

Label of Option A2 becomes Title of Frame B

1. Option B1
2. Option B2

  - Spatial Linkage:



Select how you w
search the file:

● by SUBJECT
○ by AUTHOR
● by TITLE
● by RELATIONS

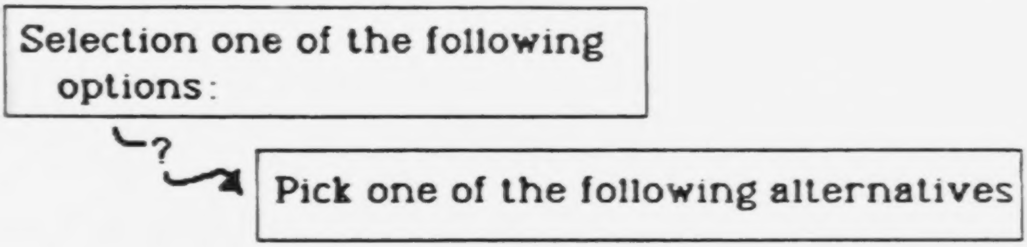
Search by AUTHOR: Select method:

- Exact name match
- Approximate match
- Pattern match
- Within a range

Figure 3

Some Factors to Look for in Screen Based Search

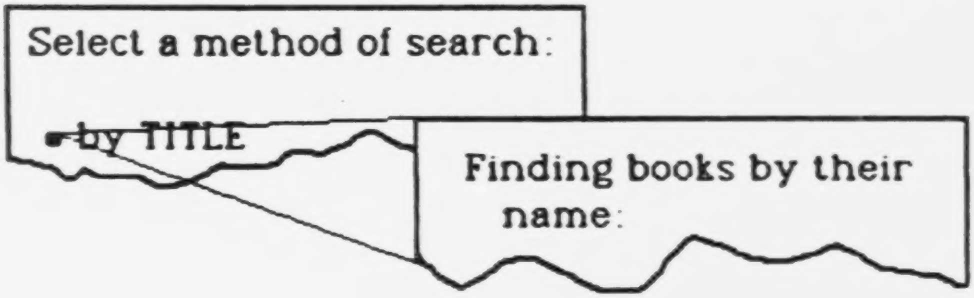
- Screen /Screen Consistency
  - Verbal Consistency



Selection one of the following options:

?

Pick one of the following alternatives

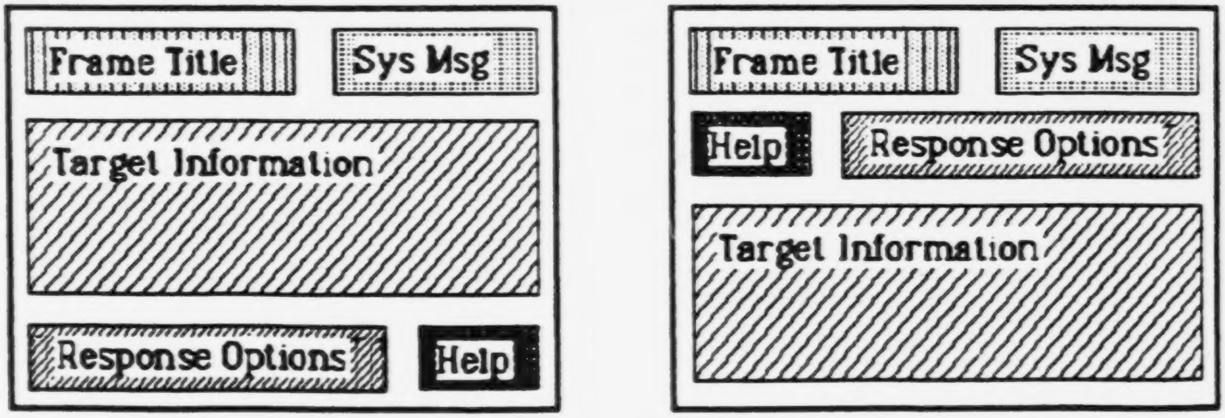


Select a method of search:

~~• by TITLE~~

Finding books by their name:

  - Spatial Consistency


Frame Title
Sys Msg
Target Information
Response Options
Help
Frame Title
Sys Msg
Help
Response Options
Target Information

This applies to both labels and instructions. The system should not instruct the user to TYPE a command on one screen and ENTER the command on another. Don't say "selecting by title" in one case and then change to "finding books by their name." Phraseology should be consistent. Although repetition is boring in human/human interaction, in human/computer interaction it is essential.

Spatial consistency is also extremely important. When a user moves from one screen to another, he should be able to find the same types of information in the same location on the display. If HELP information is at the lower right on one screen, don't move it to the upper left on another screen. Moving information to different screen locations--as shown in the lower half of Figure 3--slows the user down and breeds a sense of insecurity about what the information means.

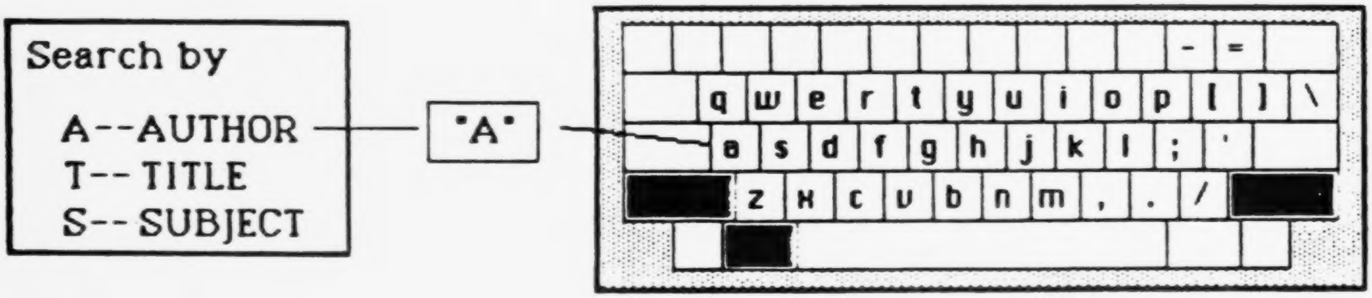
Screen-to-Selection Compatibility

The online catalog should also promote the user's understanding of his options and the method of selection. When the user wishes to make a selection, the action he takes should be compatible with the selection made, in both a verbal and a physical sense (see Figure 4). A familiar example of verbal compatibility is the use of mnemonics. The user types A for an author search. Such compatibility is not always possible when multiple items begin with the same letter. When a long list of titles is displayed, for example, single mnemonic letters cannot be used, nor is it advisable to use alphabetically lettered items. Typically, confusion arises with incompatibility of the response letter and the first letter of the title. Generally, the solution is to use numbered items. In any case, with keyboard input, the user must locate the desired option, note the appropriate response character, and locate it on the keyboard--as shown in the top half of Figure 4. Verbal compatibility facilitates this process. However, the concept of direct selection or pointing at an item can eliminate some of these steps.

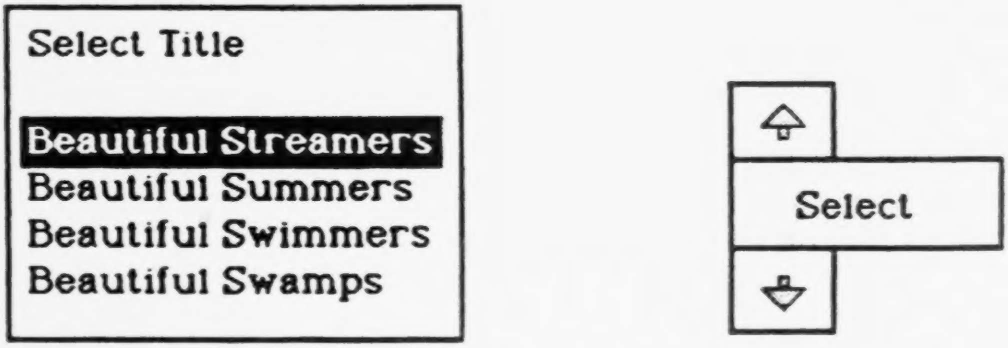
Figure 4

Some Factors to Look for in Screen Based Search

- Screen/Selection Compatibility
  - Verbal Compatibility


Search by
A--AUTHOR
T--TITLE
S--SUBJECT
"A"
- =
q w e r t y u i o p [ ] \
a s d f g h j k l ; '
z x c v b n m , . /

  - Spatial Compatibility


Select Title
Beautiful Streamers
Beautiful Summers
Beautiful Swimmers
Beautiful Swamps
Select

For example, some systems use up-down arrow keys to locate a selection on the screen, as shown in the lower half of Figure 4. When the cursor or highlighting is on the desired item, the user presses the "select" key to activate that selection. Response selection by arrow keys and other pointing devices such as the touch screen and mouse facilitate input by making direct use of spatial compatibility. There are numerous pros and cons associated with each device, and we are only beginning to do the necessary research to determine which is faster, which is less error prone, which is preferred by users. Spatial compatibility means that the location of an item on the screen and the location of response input are spatially congruent. Since the processes of pointing, aiming, and touching are so well learned, they constitute a very natural form of directing computer operations.

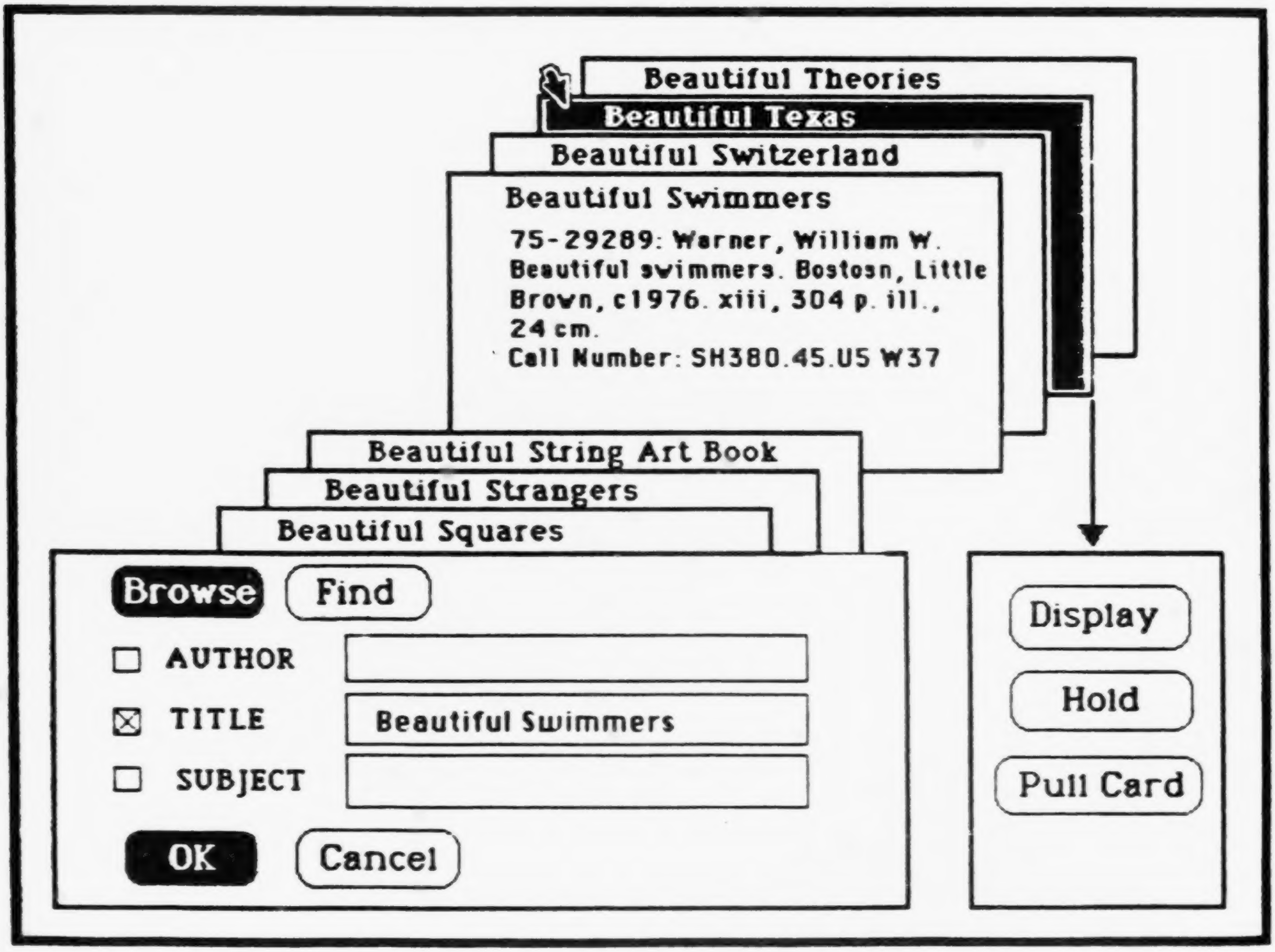
System Metaphor Compatibility

Finally, in surveying different online catalogs, I asked the question: "What metaphor of the system is being given to the user to help him think about and manipulate the catalog?" A strong system metaphor can help the user to orient himself quickly. Without a metaphor, the user may not comprehend the system's capabilities and may never use it fully. On the other hand, a particular metaphor or mental model may unduly restrict the ways in which users think about the system. For example, thinking about the online catalog in terms of drawers of cards shown on the screen (see Figure 5) may be the worst way possible to set up a mental model of this tool. The user may only think about opening up the drawer and paging through the cards; he can't think about the possibility of taking sets of records out and reorganizing them, because his model includes those little metal bars that go through the holes in the 3x5 cards.

Figure 5

Some Factors to Look for in Screen Based Search

- System/Metaphor Compatibility


Beautiful Theories
Beautiful Texas
Beautiful Switzerland
Beautiful Swimmers
Beautiful String Art Book
Beautiful Strangers
Beautiful Squares
Browse
Find
OK
Cancel
Display
Hold
Pull Card

75-29289: Warner, William W. Beautiful swimmers. Bostosn, Little Brown, c1976. xiii, 304 p. ill., 24 cm.
Call Number: SH380.45.U5 W37

☐ AUTHOR
☒ TITLE Beautiful Swimmers
☐ SUBJECT

Critique

Keeping these various considerations in mind, I'd like to close with a few general comments about the systems that I saw demonstrated here at the conference.

Use of search modes: Different search modes are particularly nice if you have discrete user populations, varying in needs and experience. However, if a particular user must himself go from mode to mode in the course of using the system, modes are probably not the right design choice. Patrons should not have to think, "Do I want to use menu selection now or do I want to go to command language?" If users have to get out of one mode to get into another mode, it wastes time and requires more effort on the part of the user. Distinct modes are a positive system attribute if you really have discrete groups; they're a negative attribute if you want users to evolve. If a system is to evolve with the user, he should be able to turn off menus or use short commands after he no longer needs the "handholding" treatment. Once a user is really tired of typing the whole command F-I-N-D, an accommodating system will say "Yes, now you can simply type F for FIND." The entire system may be in place from the start but is successively revealed to the user as he goes along. That is generally the way an educational process works. We start with something simple and then we expand. Online catalogs should do the same. At present only a few systems incorporate this idea and they are only beginning to develop it.

Clarity of response options: The user's choices about what to do next should not be strung together. When three or four dense lines of text are compacted into a paragraph, the user has to read everything. Generally, a user already has an expectation of what to do next. He should be able to scan choices quickly. Menus should not be wordy; a list is better than dense text. One of the systems that I reviewed displayed the options along with the text, all strung together, with slashes as delimiters in between options. The user might wonder, "Do I type the slash?" In another system the user did, in fact, have to type in the delimiter for the command to work. Most of the current online catalogs do display clarity of response options, but a few miss the mark.

Keyboards: First-time users have difficulty locating alphabetic and special function keys on the keyboard. Color coding can help users to find special functions quickly. In fact, thought should be given to simplifying the whole keyboard. A lot of users have preconceived notions about what specific keys do, from previous systems. They may already "know" that one way you can go up to the previous menu is by hitting ESCAPE. If that doesn't work, they experiment. Keys need to be clearly labeled, and there should be as few as possible. If certain keys are not to be used by the patron, just get rid of them.

It's probably also a good idea to separate the regular typewriter keyboard from function keys or special keys. Get them way over to one side or to the top so that the user knows where to look for them. Also, the size of keys is very important. The keys that are used most frequently ought to be bigger so that they are easy to hit. If high-use keys are the same size as other keys, there will be a high probability of one-off errors--that is, hitting the key next to the desired key. Some systems are making use of color coding, key size, and location, but for the most part standard terminal keyboards predominate.

Error recovery: How does the user recover from an error? Of course, it's very important to minimize errors in the first place, because when a user makes an error, then he has to think, "Okay, where have I been put? What new galaxy am I in now?" Identifying where you are after an error can be a very long process. The system itself may be well designed for recovering from errors, but the user is not and may only recover from the error by walking away from the terminal. Some systems give adaptive help rather than repeating the same error message over and over.

Scrolling: A loss of context often occurs with scrolling. If everything automatically scrolls (starts moving up and off the screen), the user may become confused and panic. It is best to keep things fixed. If information must be scrolled, then it is best to scroll in a separate window on the screen. Fortunately, most systems have moved away from complete scrolling (as on a teletype) and hold the context information in fixed locations.

Commands: More thought also needs to be given to command abbreviations and syntax. Commands ought to be abbreviated consistently and in the same way that the user thinks about them. If "author/title search" is abbreviated ATS, the user will expect other commands to consist of the first letter of each of the terms. For example, he expects that author search would therefore be AS; but the designers of one system decided to stay with three characters as the rule, and abbreviated it AUS, using the first two letters of the first word. The user, now getting wise, might guess that the command for a title search is TIS. Unfortunately for the user, the designers chose TLS, to baffle us all. The user knows that the abbreviation is always three letters, but there is no rule by which he can generate the command.

There were many other confusing commands in the online catalogs displayed. In general, specific commands and their abbreviations are the result of unsatisfactory compromises between opposing camps; and, as usual, the user is the loser. A total rethinking of the command language--or total abandonment of it--may solve the problem.

Editing input: Computer programmers, librarians, and patrons are not the best typists in the world. They make errors all the time. Often I see people struggling to type in a long name or title, and making a mistake somewhere. Nothing frustrates a user more than an error due to mistyping a command or entry and then having to type the whole thing over again. Users should be able to go back to the incorrect text and edit it. However, few systems let the user move the cursor right back and edit the previous input.

Conclusion

In summary, I think that more time needs to be spent on human factoring. This battle cry for human factoring needs to be heard over and over again. Human factor these online catalog systems. Great work has been done so far in all of the other aspects of system design. Now we really need to invest more time in reducing user errors. Poor human factoring of online catalogs is like designing a car by hiding the ignition, putting the steering wheel on the floor, and moving the accelerator to the glove compartment. In the same way, the use of online catalogs is restricted by designs that may simplify things at the software level but make no sense from the perspective of the user.

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V. ONLINE CATALOG SCREEN DISPLAYS: A HUMAN FACTORS CRITIQUE

Christine L. Borgman

I've been involved with online catalogs in various capacities for more than ten years now. I have seen some evolution over the years, but there are certain aspects of online information retrieval that have not come a long way. All of the issues we've been talking about--from design to training to screen displays--are still in their infancy in terms of ease of use.

Background

I want to set the context for my remarks by asking, "What does it mean to evaluate screen displays?" After reviewing the literature, I have identified five different levels at which screen displays have been analyzed: physical legibility, cognitive processes, command language, system metaphor, and interface (Figure 1).

1. Physical Legibility

The first level is physical legibility: How well can you read the display? A lot of human factors research has been done in this area. A number of variables can be examined at this level (Figure 2). For example, researchers have asked how well the CRT symbol generation is done. They look at the font, the dot size, and the definition of symbols. Also of interest are CRT raster variables. How often does the image refresh? What's the luminescence? What's the phosphor persistence?

The variables I have mentioned come from a report by the Canadian Department of National Defence (Gorrell, 1980). The Defense Technical Information Center collects a lot of data in this area. The military is very interested in displays, and much of the early human factors work comes out of the military.

FIGURE 1: LEVELS OF ANALYSIS OF SCREEN DISPLAYS

1. PHYSICAL LEGIBILITY
2. COGNITIVE PROCESSES
3. DISPLAYS IN CONTEXT OF COMMAND LANGUAGE
4. INTERFACE AS A WHOLE

FIGURE 2: PHYSICAL LEGIBILITY VARIABLES

CRT SYMBOL GENERATION VARIABLES

- FONT
- DOT SIZE
- DEFINITION (DOT MATRIX DIMENSIONS)
- SUBTENSE
- ASPECT RATIO
- SPACING
- LUMINANCE AND CONTRAST

CRT RASTER VARIABLES

- REFRESH RATE
- RESOLUTION
- INTERLACE STRUCTURE

CRT PHOSPHOR VARIABLES

- PERSISTENCE
- SPECTRAL RESPONSE

MATRIX SYMBOL GENERATION VARIABLES

- FONT
- DEFINITION
- SUBTENSE
- LUMINANCE AND CONTRAST
- EMITTER SIZE
- EMITTER SHAPE
- EMITTER CHROMATICITY
- PERCENT ACTIVE AREA

OTHER FACTORS

- SYMBOL SET
- SYMBOL FORMAT (SYMBOLS/ROW X ROWS)
- ANTI-REFLECTIVE DISPLAY SURFACE
- TREATMENT
- SCREEN SIZE
- SCREEN ORIENTATION RELATIVE TO
- VIEWING ANGLE
- HIGHLIGHTED (INVERSE VIDEO, BLINKING, DUAL LEVEL LUMINANCE)

GORRELL, DEPARTMENT OF NATIONAL DEFENCE - CANADA, 1980

2. Cognitive Processes

The second level at which you might evaluate screen displays is in terms of cognitive processes (Figure 3). Several aspects of cognitive processing are relevant to screen displays. The first is presentation rate--how much can people absorb as input? Variables include short term memory, long term memory, and "curvilinear effects." By "curvilinear effect" we mean that people are able to remember things at both ends of a range of displayed items but not so well in the middle. It follows that system designers should not bury the most important instructions in the middle of a long display. Designers should also be careful to keep the presentation rate, i.e., how fast new information is shown to the user, within the limits of what people can "chunk." The average user can comprehend seven (plus or minus two) chunks of information.

Symbol principles relate to methods of making messages distinct and easily understood. For very elaborate tasks, such as airplane control displays, it helps to provide the user with auditory signals as well as visual signals. You can do this on an online catalog terminal, too. Bells ring, things beep at you, keyboards lock up, etc. Mnemonics and acoustic confusability are also important. We find that people confuse words based on how they sound as opposed to what the letters are--weight and wait are likely to be confused, for example.

Processing capacity is also important to screen displays. The user can store more information if it is pushed into meaningful chunks. If a list exceeds the user's capacity, the curvilinear effect begins to operate. We found time and time again that if you give people lists of ten, twenty, fifty, a hundred items, the ones they are most likely to remember are at the very beginning of the list or at the very end. It's the ones in the middle that they lose. Long term memory is a factor, too. Don't expect them to remember everything. Come back and remind them every so often.

3. Command Language

The third level of analysis is to look at displays in the context of the command language (Figure 4). Here I am talking about the headings, the placement of data on the screen, the use of labels, the consistency of terms, the arrangement of the display. We also need to examine how fast the user can respond, and how accurate that response is going to be, based on how the information the system presents fits into the way users are asked to respond, and how that in turn matches what the system gives back to them.

FIGURE 3: COGNITIVE PROCESSING GUIDELINES

PRESENTATION RATE

- KEEP WITHIN LIMITS OF SHORT TERM MEMORY CAPACITY
- CUE MOST IMPORTANT INFORMATION SO IT WILL BE PROCESSED FIRST

SYMBOL PRINCIPLES

- CHOOSE SYMBOLS UNLIKELY TO BE ACOUSTICALLY CONFUSABLE
- USE AUDITORY SIGNALS, IN COMBINATION WITH REDUNDANT VISUAL SYMBOLS, TO NOTE IMPORTANT CHANGES IN A VISUAL PROCESSING TASK
- USE SYMBOLS WITH NAMES, AS THEY ARE MORE EFFICIENTLY STORED IN SHORT TERM MEMORY THAN RANDOM SYMBOLS
- USE SPATICAL REPRESENTATIONS TO ASSIST IN OVERLOAD SITUATIONS

CAPACITY PRINCIPLES

- REDUNDANT STIMULUS INFORMATION WILL INCREASE SHORT TERM MEMORY CAPACITY
- CHUNKING ITEMS INTO CODES INCREASES STORAGE CAPACITY
- REHEARSAL PROCEDURES CAN INCREASE THE NUMBER OF ITEMS STORED IN MEMORY; HOWEVER, THESE PROCEDURES INTERFERE WITH ANY OTHER PROCESSING THAT MUST BE DONE
- IF A LIST MUST EXCEED CAPACITY, THE FIRST AND LAST FEW ITEMS ON THE LIST SHOULD BE THE MOST IMPORTANT ITEMS
- TASKS WHICH OCCUPY THE SAME MEMORY DOMAIN SUCH AS SPATIAL MEMORY CAN INTERACT WITH EACH OTHER TO CAUSE OVERLOADING

LONG TERM MEMORY PRINCIPLES

- LISTS THAT ARE LONG AND DETAILED SHOULD BE PASSIVELY STORED IN THE COMPUTER UNTIL CALLED UP BY THE OPERATOR
- SYMBOLS THAT MAY BE USED FOR DIFFERENT RESPONSES SHOULD NOT BE SEMANTICALLY SIMILAR

ADAPTED FROM BARNES, NAVAL WEAPONS CENTER, 1981

FIGURE 4

COMMAND LANGUAGE CONTEXT

CONSISTENCY

ARRANGEMENT

SPEED OF RESPONSE

ACCURACY OF RESPONSE

4. System Metaphor

The fourth level of analysis is an examination of displays in the context of a system metaphor or conceptual framework. This is what is sometimes referred to as "mental models." Quite a bit of research in cognitive psychology indicates that if people have some conceptual framework around which to organize information, they remember it better. We have done training experiments where subjects are given an organizing metaphor. It might be something physical--such as a card catalog or a filing cabinet for information retrieval, or the desktop metaphor for office tasks that is so popular on the Macintosh. Or it may be a more theoretical, abstract framework. If you give users this framework first and then give them the specific commands, they can go further in a system with less effort than if you simply say "First do this, then do this," and don't give them anything with which to organize the process.

People have a natural tendency to try to build some kind of mental model of the way a system works. If the system itself doesn't give users some organizing clues, they are going to make their own model, and it's probably going to be the wrong one. Then they will make assumptions based on what they think the system is going to do next and will get themselves into error traps. Without a metaphor to use as a road map, they get lost. They go further and further away from what they are trying to accomplish because they have incorrect expectations about what the system is going to do.

You can look subjectively at how well a system meets the criteria for a system metaphor. Ask, "Do all the pieces fit together?" Or you can do your evaluation very objectively. You might run experimental subjects through different kinds of training before using a system, or have them look at different interfaces to the same system. I like Ward Shaw's suggestion that we grab the waiters and the desk clerks here at Lakeway and bring them in to see if these systems really are interpretable.

5. Interface

The fifth and last level of analysis would be the interface as a whole. There are lots of definitions of system interface, but the one that I like best is one that Tom Moran proposed a couple of years ago: "everything the user comes in contact with physically, conceptually, and perceptually." Interface encompasses much beyond the screens and command language. It includes the documentation, the work environment, the user's job status, attitude toward the system, prior computing experience, and the personal and demographic variables that he or she brings to the system. An "interface view" is the big picture that extends far beyond the specifics of screen displays.

From all the research that has been done at all of these levels, the most we have is guidelines. We have no proven absolutes for proper screen displays or for any other aspect of interactive system design. The work that has been done is still hard to compare across systems. Studies use different subjects, different kinds of research designs, different kinds of systems, different variables. You very often find conflicting results. The closest I've seen to hard standards in this area is work that is being done to set standards for the design of testing to set standards.

Evaluation of Demonstrated Systems

For this conference, I think we are concerned with the mid-range level of analysis. I don't think we want to look at raster refresh rates and I don't think we are in a position to look at people's attitudes toward the systems. I think we are really looking at the displays, the command language, and some consistent metaphor or framework for the system.

For my evaluation of the online catalog systems that are represented at this conference I focused on six variables: audience suitability, system metaphor, command language, legibility, special features, and ease of use.

1. Audience Suitability

The first thing I looked at was audience suitability. Were these systems aimed at novices with no experience? Or did they seem to be aimed at experts, people who had some computer experience? Or somewhere in between? It is very hard to optimize for both groups, and any online catalog will always have novice users. You also have to meet the needs of staff and fairly sophisticated regular users. It seems to me that in most library environments, when you have to make a choice, you should lean toward the novice end user. Many people will be permanent novices. They will come to the system only infrequently, and when they do come they won't stay very long. In some settings, there is a very high turnover rate in clientele.

In evaluating these systems, we must consider who the users are and how much they are willing to invest in the system. One of the things we learned in the nationwide public access catalog study that CLR funded a couple of years ago was that nonusers were most likely nonusers because they claimed they did not have time to learn how to use the system (Matthews et al., 1983). Very few nonusers, something like 9 percent, said they weren't using the online catalog because they didn't like computers. The most common reason given by far was that they had not had time to take the training. The next question was, "How long do you think it would take to learn to use the online catalog?" We gave them a number of choices: a week, a day, half a day, an hour, fifteen minutes, thirty minutes. Sixty-four percent of them checked either fifteen minutes or thirty minutes. Clearly they are not willing to invest very much time in learning to use the system.

For this review we had, on average, fifteen to twenty minutes to spend with each of eleven or twelve systems. Kent and I are sophisticated users. If we couldn't get a pretty good grasp of how that system was working in fifteen to twenty minutes, how well can somebody coming off the street learn to use that system in the amount of time they are willing to invest?

The systems I reviewed fall into three different groups. At the top are systems that are very easy for a novice to use. You really could feel like you were using them effectively in fifteen or twenty minutes.

I only put one system in this category. At the second level are systems that are easy for the sophisticated user to use. They require more overhead and are a little more powerful. There are maybe three to five systems in this group. The last category includes the systems that are hard to use for everyone. They seem to be aimed more at library staff than at general users in terms of the kind of jargon used, the kinds of system capabilities offered, and the kinds of assumptions made about how a user is likely to approach a search.

One key ingredient in designing a system for a specific audience is online "help" tailored to that audience. I saw one or two systems that had no help built into them whatsoever. At the other end of the scale, I found help that was very well integrated into the structure of the system. You didn't get a pile of help screens dumped on you at the beginning, to read through and forget. Instead, you got help as you needed it. If you asked for an author search, you then got an instruction for the author search and a quick indication of where to get deeper information if needed. At least one system offered local help. You could type HELP at any point and the help that you got was triggered by where you were in the system. In all of the systems I saw, the user could go from a search into help and back again. I do know of systems where, once you go into help, you've lost your search and have to start all over again.

The content of help messages ranged between two extremes. At the low end was help content that was really just semantics and syntax: "To do this, type this." At the other end was the more conceptual help. This gave you, for example, searching tips: "This is where you should look if you want this kind of material." Or, "You didn't get any hits. Make sure your spelling is right; try synonyms." Or, "You got too many hits. Consider limiting your search by one of these methods; consider using these other terms."

2. System Metaphor

The second variable that I looked at was the consistency of the system metaphor. Has the system been designed around some consistent framework? Could a user predict the behavior of one part of the system from looking at another part of the system? Here I was picking up features like: Was the search repeated on the screen? Were the options given? How mnemonic were the commands and labels? I looked for internal system consistency and I looked for a logical conceptual framework.

Again I found a range. At the very top was a system that looked like it was designed by just one or at most a very small number of people. The system designer(s) started with a consistent conceptual framework and said, "This is what we want the system to look like. We are going to fit everything inside this little circle so the pieces all point inward and relate to each other." This system had searching tips and conceptual help built in. It didn't dump too much on you at once.

At the lower end of the range for metaphor were systems that I thought were very piecemeal. I had a hard time figuring out how they worked. Just when I thought I had a picture of the system in mind, it showed me a whole new subroutine that I didn't realize was there. It seemed as if somebody built that piece and somebody built this other piece, and the user had to build up a separate mental model for each of the different pieces and then try to assemble them into a framework. These systems would take quite a bit of training--perhaps from weeks to months of consistent use--for a user to build a strong framework.

In qualifying my evaluations of system metaphor, I do want to make several points. There was a correlation between the consistency of the design and the age of the system. Systems that were fairly new seemed to be put together based on some specific idea of market demand. They were more likely to be built over a short period of time, with fewer people involved, and to come together consistently. Systems that had been evolving over five, ten, twenty years may have been through a lot of committees and a lot of changes in design personnel. The longer it takes a system to evolve, the less likely it is to keep one consistent framework.

Another factor is the degree of system complexity. The systems that only did straight author/title/subject searching--no keyword, no Boolean--tended to be simpler and more consistent. Then again, they didn't do as much. The more capabilities you add, the harder it is to keep them within a consistent framework.

Yet another factor was the display of options on the screen. Sometimes screens were kept very simple by only showing a few of the options. That made the system look simpler and gave the user a smaller picture of what the system could do; it also constrained the user. For information about more complex options, the user was forced to consult the written documentation that accompanies the system. Systems that list all the options give the user a bigger picture, at the risk of introducing inconsistency.

3. Command Language

The third factor I evaluated was the command language implementation. Was the system command driven? Was it menu driven? Was it somewhere in between? Menu vs. command is a continuum, not a dichotomy. What kind of jargon was used? How ambiguous were the terms? I looked for verbal consistency, semantic consistency, syntactic consistency, and so on.

This ties in very closely with the metaphor, particularly in the display of options on the screen. Some designers went to such extremes of getting absolutely everything on the screen that they ended up with a lot of clutter. Systems displayed things that would be used by one out of a hundred people. There were up to a dozen options on the bottom of some screens that had to be read through every time before choosing the next step. Maybe a two level menu, or a listing of only the most commonly used commands, with an indication of how to use "help" to get to some of the others, would give a more consistent, easy-to-use framework.

I also found that in avoiding jargon, several systems went to meaningless terms. Very terse commands, like "tab cursor to input point" are hard to follow if you don't understand what a cursor is. In the context of a CRT screen, FIRST, CONTINUE, BACK, NEXT, and PREVIOUS are all meaningless terms. I wanted to go to the previous screen in one system and hit PREVIOUS, and it turns out that what I wanted was BACK. NEXT/PREVIOUS only applied to multiple screen displays of one record.

Mnemonics can do a lot to enhance the clarity of command language. Some of them were quite good and some were very strange. My favorite was "IND = see list of headings." I assume that IND means index. On one system, in a list of what kinds of searches are possible, SUBJECT and GENERAL TOPICS are both listed. "General topics" turns out to be keyword searches of the subject and title fields. All of the systems had command language problems--some of them worse than others.

4. Legibility

The fourth variable that I considered was display legibility. How easy are the screens to read? Can tags be distinguished from text? Are the meanings of the tags clear? Is information logically arranged? Can important data be distinguished quickly? How is the blank space used? How much clutter is on the screen?

At one extreme was good use of labels for both brief and long displays. On many systems, however, brief displays have no labels. They just run on over several lines. Long displays were more likely to have labels. There was some good use of highlighting to help users pick out important data. Two systems highlighted the data and not the labels. I was surprised at how little use of tagging there was overall.

At the other end of the scale, there were a number of unlabeled card catalog-type displays. One feature that I found especially problematic was a tendency in several systems to split up the bibliographic display into multiple pieces. It took as many as three different screens to get all of the bibliographic data. The user had to go to one place to find descriptive data, someplace else to find location data, and someplace else to find status data. This prevents the user from building a model of how the pieces fit together. I can guess where this problem came from in terms of design constraints; displays were patched on as designers added new capabilities.

A number of the nonbibliographic displays were quite cluttered. Some of them had too many screens--it seemed that you went on and on and on. Some systems mixed help and data very well on individual screens; others forced you out of searching mode and made help very separate. On several systems it was difficult to distinguish between user input and system output. It should be obvious what and where you are typing, where the cursor is at any given time, and what's come back to you from the system.

5. Special Features

Fifth, I looked at the use of special features. What use did the system make of highlighting, of boldface, of reverse video? Did anybody use a mouse, a joy stick, a touch pad, touch screens? Did they use dynamic pop-up windows? How did they use function keys? In what way did these things enhance the use of the system?

The most common features were highlighting and function keys. I found some good use of highlighting to distinguish the data from the field tags. I saw another very nice feature--when you did keyword searching the word that you had matched in the record was highlighted. It's very easy to see why you hit a record on that system. Some of the highlighting, however, seemed gratuitous, as though it had been applied at random.

Function keys also represented two extremes. Some were used to simplify. On one system, a nice little key pad in the corner offered six or fewer function keys, clearly labeled, in different colors. You could use these to reduce the amount of typing. On other systems there were too many function keys, or they were poorly labeled. One system used a function key in the far upper left hand corner of the keyboard instead of a RETURN or ENTER key. From a human factors standpoint, you want to keep the user's hands on the keyboard as much as possible. That is one of the complaints about the mouse and the joy stick. If the user is working down here with alphabetical characters and has to go up here to hit the SEND key, she is constantly off the keyboard. That results in more one-space-off kinds of errors. Also, being right handed, I find that going to my left every time I wanted to send a command was very awkward.

Only one system I reviewed used any kind of color graphics. Color was very helpful to distinguish between input and output. The system output was always in one color; what the user typed was in a very different color. Other systems may have that capability. Nobody who demonstrated a system here used a mouse; nobody used pop-up dynamic menus; nobody used fancy windowing. That's also hard to do on a dial-up mode. It may be possible that some of these systems have features like this when you're looking at them in a local environment. Dial-up access, as was the case here, often provides fewer, less powerful system capabilities.

6. Ease of Use

The last factor I evaluated was the overall ease of use. Here I used this delightful rating system, courtesy of Joe Matthews and Joan Frye Williams. They have rated systems in great detail from the "user intimate" system to the "user vicious" system (Figure 5). Rather than go through their entire taxonomy, let me describe just a couple of points. The "user intimate" system is a system where use is second nature. Help is constructive and unsolicited; it corrects common errors, and the system adapts to the user rather than vice versa. The middle point on the scale, the zero or "user oriented" system, is where the user must be trained or oriented in system use. These are neutral systems that can be learned in two to three hours. The design of a user oriented system is focused primarily on system capabilities, and commands and structure are fairly consistent. At the bottom of the scale, the "user vicious" system is mean and nasty and inflicts cruel and unusual punishment on users. It is heavily coded and there is minimal use of any kind of English or natural language.

Here are my impressions of the ease of use of the systems I reviewed: I gave a plus three (+3) to one system. I gave one system a plus two (+2), one a plus one (+1), two zero's, five minus ones (-1), and one minus two (-2). So there is a cluster around the middle of the range.

Conclusion

Just to close, I would like to say that the systems certainly do look better than they did five years ago, but there is still room for improvement. Too many of these systems look like they were designed by committees--committees that were heavily weighted toward catalogers. What we know about human factors research should be part of the system design. Applicable data do exist and I hope that we can put them to good use in the design (and redesign) of online catalogs.

FIGURE 5: USER FRIENDLY INDEX

+4	USER INTIMATE SYSTEM
+3	USER FRIENDLY SYSTEM
+2	USER CORDIAL SYSTEM
+1	USER POLITE SYSTEM
0	USER ORIENTED SYSTEM
-1	USER CRABBY SYSTEM
-2	USER ORNERY SYSTEM
-3	USER HOSTILE SYSTEM
-4	USER VICIOUS SYSTEM

SOURCE: MATTHEWS, J. R. and WILLIAMS, J. F. "THE USER FRIENDLY INDEX: A NEW TOOL." *ONLINE*, 8(3) (MAY, 1984), p. 31-35.

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DISCUSSION

Jones: When I was making the initial calls, inviting participants to this conference, many people said they hoped that we would invite as wide a range of systems as possible. According to the reviewers, we do have that sort of range. The objective now is to move from a set of circumstances that now exist to a new set, two to five years hence, when improvements will have taken place. Fran suggested that improvements in systems have been driven by users. But some of the difficulties perceived in present systems are in fact the result of features being designed for librarians and not for end users.

Spigai: In the past, bibliographic systems were designed for librarians. However, I don't think that will continue to be the situation in the future. End user systems, such as online catalogs, typically see only a small number of repeat users. There isn't any continuity or consistency in user demands or interests. On a college campus you've got maybe four years' comments if you're really lucky. You don't get fifteen to twenty years of feedback from the same users. Until now, each online retrieval system heard primarily from a closed user group, users who are aggressive in terms of saying what designers should do. I think that is part of the reference utilities' problem. They aren't hearing from the constant, permanent novices.

Comment from the Audience: There's another research issue, dealing with users moving from one system to another. When they first sign on, is the system interesting to them? What about that first screen that comes on--is it enticing? If I had the option of going to the card catalog or the computer, I would go to the computer. But that's just an initial attitude that I have. After dealing with some of these online catalog systems I think I would actually choose the card catalog! In the card catalog, I can pace the search at my own rate. Plus, I have a much wider scan; I'm able to look at all the reference tabs that are in the drawer.

When I'm playing with catalog cards I'm using my fingers. It's very intimate. When I pull open the drawer and see those areas that are dirty and bent over, I say, "Wow! What's this?" I have an immediate sense of what has interested other users. Then there are those cards that stick up because they are new entries; they also grab my attention. There are a lot of other tactile attributes that computers can't offer. That's probably why CRT screens really do start to look dull after a while, even the ones with some color. They're overloading the visual sense, but stimulation for all the rest of the senses is lacking. I think that online catalogs need to have an excitement feature that moves you along rather than puts you to sleep.

Radke: We have a feature on MELVYL called the "comment command." It's certainly a very unscientific way of gathering information. However, it's becoming an increasingly popular command. I'm in charge of answering the comments. Most of them are suggestions; sometimes there are questions. Over the last three years the comments have repeated themselves, over and over again. "Give us printers," they say--and we haven't done that. When we first implemented this command, there were a number of staff people who asked, "Do we really want the users to tell us things? Do we want to pay attention to them? How can we respond to users when they ask us things? Are they going to expect MELVYL to say something back?" Our distribution system for answering the comments has not been set up yet, but we're trying. I have received fifteen, twenty, even thirty line comments; one professor wrote a long dissertation to me about how our display of festschriften was wrong. I think those things are very valuable.

Salmon: I want to pick up on something that others have said and take it one step further. I think there may be a bigger problem here than the Council realizes--certainly bigger than many libraries and librarians realize. Unlike many industries, we are selling to people who are different from the people who actually use these systems. That has some enormous implications. I think all of us would like to design systems that are easy for the end user to use, and we are trying to do that. What happens is that we vendors find ourselves selling to librarians. And they want LCCN and ISSN and OCLC number and RLIN number. We've got clients who want to get out everything they have in the library in German, not as a limiting index (limiting by language) but as a primary index. The librarians want to search juvenile as a primary index, to search fiction as a primary index. In many cases, their requests are directly contrary to the CLR study findings about what users need and want. What we vendors need is for somebody to educate the librarians in the results of the previous CLR studies (I'm going to pay for this, I suspect) and in the human factors research. Librarians who are buying systems need to hear what Christine and Kent and Fran are saying.

Borgman: I was amazed at how little awareness there was of the amount of human factors research that had been done. This data exists outside ITAL and JASIS. Let me strongly urge good, solid, empirical research. Granted, you can get a lot from user feedback. But you've got to realize that you're going to get user feedback only from the most vocal users, who are not necessarily representative of everybody who is out there. Until you get raw subjects from a broad population (raw being the ones who are not necessarily consistent, heavy duty library users--undergraduates, secretaries, business-people, house-people) involved in your testing, you're not going to get a good enough sample.

It looks like NSF (National Science Foundation) is very interested right now in empirical research in this area, and is willing to fund it. I strongly encourage anybody who is interested or who has faculty on campus with whom they could work or perhaps offer a test base, to do so. For word processing there is empirical data all over the place. We need more of that data within information retrieval.

For a review of the last two years of psychological research in human factors and online systems, my chapter in ARIST that came out last fall [Annual Review of Information Science and Technology, volume 19, 1984] has about two hundred citations. I hope it is a fairly comprehensive review, and may be a useful starting point for reading in this area.

Crawford: Yes, we absolutely have to be concerned with users. But I hear people saying, "It's a shame we have to provide all this power to librarians when the users don't need it." What we're really talking about is the difference between power and design. I certainly agree that putting up thirty indexes on a single screen is overwhelming. That doesn't mean that it isn't possible to support thirty indexes. To tell librarians, "You can't have ISBN searching because that will confuse the user," is not reasonable. We need to educate librarians that the primary displays should be those most needed by the users.

Senzig: Online catalogs obviously need to be designed for the novice user, but the reference librarian is also asking for important features. That librarian has been getting questions from users every day for ten or fifteen years, and she knows what the problem areas are. On our campus we have a major festschriften program; it's important to be able to go in and find every single one of these works in our collections. When a research program spends thousands of dollars to analyze the content of these festschriften, our support for that research needs to be specific, not general. We're asking for much more from a computer catalog than we ever did from a card catalog, based on those 15-20 years of experience on a reference desk.

VI. BIT MAPPED DISPLAYS AND ONLINE CATALOGS

Alan Kay

When I saw the title for my talk, I thought, well, there are five hundred thousand dots on a bit map display, and I could fill out an hour by talking about each one individually. But I figure you might actually prefer talking about user interface design. In order to get started, let me give you a little bit of background on where some of the user interface designs came from.

Early Graphics Displays

Computer graphics goes back to around 1962. This film [of the Sketch Pad system] shows the first computer system ever to have a window. This computer is brute forcing the display by putting up each dot on the screen individually. Sketch Pad was unusual because the user could establish a set of basic rules--for example, that all lines drawn on the screen should meet at right angles--and Sketch Pad would consistently carry them out. The user can distort this drawing as much as he wants, and the system will make sure it'll always conform to those general rules. This is one of the first artificial intelligence programs--still one of the best. It was also the first object-oriented programming system and the first non-procedural programming system. It was all done in one year by one person. I asked Ivan, "How could you have possibly done all this in one year?" and he said, "Well, I didn't know it was hard." Graphics systems didn't become hard until after Sketch Pad. Sketch Pad is twenty-three years old, and you still can't buy a graphics system that will do all that. It's sobering, isn't it?

Sketch Pad was one of the first systems where the human-computer interaction was palpable. You could feel as though you were actually connected to it, the way a musician feels connected to a musical instrument.

In 1962 we also saw the world's first personal computer. About two thousand of these were built. And this first personal computer had a bit map display. It didn't have a lot of bits on it because bits were incredibly expensive in 1962. But it was self-contained; it was used by biomedical technicians without the aid of professional programmers.

Five years later, in 1968, we see a machine that I worked on in Salt Lake City. This machine did not have a bit map display. This is a high quality calligraphic display. At that time, we couldn't get enough bits to get a decent looking image. One of the goals of any display is that you're supposed to be able to read it with ease. You could never tell that from looking at displays today. Displays today are hardly better than they were twenty years ago. They are, in fact, almost illegible.

In that same year, 1968, we saw a flat panel display, and that gave us the idea for the Dynabook. This cardboard model was made fifteen years ago. What we really wanted was something we could carry around with us--so portable that we could carry something else at the same time. Point five (.5) herniations per block is not portability! We called this the Dynabook because we wanted it to have a lot of the very nice characteristics of the older technology we call B-O-O-K: Basic Organization of Knowledge. Books are solid state, two and a half megabytes, really inexpensive, and there are a hundred million titles to choose from. You can take one to the beach; you can read it in the sunlight. It's a pretty good piece of technology.

The User Illusion

When a medium, which is what this is (computers aren't tools, they're media; media that have to be read and written) goes public in a big way, a lot of care needs to be given to the user interface, or what we used to call the "user illusion." Illusion is a better word, because what you're doing when you create the user interface is what a theatrical director and scenic designer do in the theater. You're not trying to imitate the real world. It's very bad to build real-world-only limitations into a system that can be anything. You should only use real world symbols sparingly, in order to promote recognition. Basically, you're not trying to teach people to use systems. Icon-oriented interfaces, the kind that people are familiar with on the Macintosh, do not teach users anything. They simply help them to recognize a scene that they've seen before.

Let me show you one other piece of technology that was around back then but hasn't been exploited yet. It's another 1968 system, called GRAIL, for Graphical Input Language. It was developed at Rand Corporation. Notice there's no keyboard here. The user is drawing in a rectangle, and the system recognizes that he's drawing a rectangle. Now it's recognizing his handwriting, see? This is the first system to allow the user to change the size of a drawing by pointing to the lower right-hand corner of the shape and moving it in or out. The drawing can be relocated by pointing to the upper left-hand corner and repositioning it on the screen. Just scrub it out to erase.

GRAIL was another one of these systems you could touch; you were right there, involved with the system. It started giving us some ideas about what it actually means to interact with a system. It isn't just a matter of you-do-something and then it-does-something and you-do-something and it-does-something. It's a set of sensations that are more like theater and musical performance than anything else I know. Those things have to do with engaging your user. Will the user explore spontaneously? Will the user try typing random things to see what will happen? The Mac is the only system out there right now that inspires people to try out commands. Why? Number one, there's an UNDO command; and number two, very early--in the first minute or two--when users sit down at the screen, they have a sense that the machine is not going to screw them. I would hate to tell you how many months were put into the original designs just to try and get a system that, sitting there on the table, would say, "I'm not going to screw you."

An even better user interface would be, perhaps, something like Disneyland. Disneyland is the amusement park that was designed to be walked around in. Walt Disney got his storyboard artists and went to a big gymnasium in Southern California. They took the plans and storyboarded every walk through the park. Walt could walk around the gymnasium, and look off this way and take this walk, and look off that way and take that walk. He got to test out what Disneyland was going to look like before it was built. That was critical, if you think about it, because Disneyland has many clashing styles--except they don't clash. The reason they don't clash is not an accident. If you want to see the styles clashing, go to Disneyworld in Florida. It's almost exactly the same layout, except the park is bigger. Unfortunately, the goal of Disneyworld in Florida was not an enormous user interface. The goal in Florida was crowd control. Three times a minute, at Disneyworld, you can turn around and see color combinations that don't work, or juxtapositions that are really weird. They didn't worry about that at all. And yet, compared to downtown L.A., Disneyworld in Florida is still a pretty good design.

We don't really know much about designing the computer interface; all of our analogies come from other places, like amusement parks, and theater and music. What happens when you sit down and enjoy music? Hindemith calls it "co-creation"; what you're doing is following along with the composer. If, every second, something completely unexpected happens, you start getting upset. If what's happening is completely predictable, you start getting bored. But if what happens is something you didn't expect, but can instantly see why it fits into the inner structure of the piece of music, you feel elated. That's where the big musical high comes from--from these unanticipated things that you can instantly fit into a grander scheme. So, the first rule for good user interface is that people should be able to understand what the system can do for them in the first thirty seconds. And within two minutes, they should be able to understand what it won't do for them. That's rule number two. VisiCalc sold like crazy because it had that property. People could immediately see that this system was a car that they wanted to learn how to drive.

Don't expect to teach users all the intricacies of the system up front. No matter how you boil things down, there are lots of different command sequences of various kinds. No matter how iconic you make a system, there's going to be a lot of stuff to get across to the user. Look at all the different menus on the Macintosh. You're not going to teach people fifty or sixty commands. What you want to do is get them engaged. It's called "keeping them there after the intermission" in the theater business. Let them know that there are further delights to come.

What I'm going to try to do today is to see if we can get you to guess what the user interface might be like in the future. The best user interfaces are the ones that disappear from view almost immediately. That elusive nature makes them difficult subjects for speculation. Scientific thought requires speculation. But computer science as it is most often practiced is not a science. As my old mentor Bob Barton used to say, "System programmers are high priests in a low cult." In fact, computer science is not even a philosophy. Computing is fluid and transitory. It's more like an art form, and, because of that, we have to build things before we can understand them.

Bit Map Screens

When we started working on the Dynabook, we decided to use a bit map screen, for various reasons. We wanted the system to be able to support design. One of the problems with designing with standard computer graphics is that the lines are too crisp. You've got to be able to smudge things up. Sometimes, out of the smudges, the idea comes. You can't tell in advance which smudges are significant. The problem with typical computer displays is that every time you draw a line, that line becomes significant. That could keep you from ever having a good idea.

Allowing smudges should not mean sacrificing the clarity or legibility of the display. Niel Postman said, "Images are there to be recognized; words are there to be understood." And there's a vast difference between the two. The difference between those two perspectives is the difference between medieval civilization and ours. It's a big deal. What we're doing now with television and low resolution graphics is putting people into a position of recognizing more than understanding. It's a disaster in the making.

The basic message of the bit map screen is that it's magnificently indifferent to what images you're going to put on it. These early screens have about the same resolution and legibility as newsprint--maybe a little worse than newsprint. Typical computer displays have a contrast ratio of about fifteen or twenty to one (20:1). The contrast ratio of newsprint is about six to one (6:1). Effective resolution on newsprint is about a hundred or a hundred and twenty dots per inch; Macintosh is seventy to eighty.

We did a lot of tests on the bit map displays. We discovered that they were much more readable than any other kind of computer display. You might wonder why the early designers went against all conventional wisdom and tried to make the display look like ink on white paper. Isn't that imitating the real world? We discovered that, when you look at a display that has light characters on a dark background, as most of them still do today, your eyes dark-adapt. The light-revealing area is low. That's okay. But when you look down from the screen at the paper that's on your desk, your eyes light-adapt. You move back to the display and they dark-adapt. If you ever wondered why you get eyestrain from looking at a computer display for more than half an hour, that is one of the reasons.

What is your ability to see a small dot? Now, the last thing you ever want to see on a display is a small dot. That interferes with the illusion. What you are really hoping for is images and photographs. I found that if I plotted the ability to see a small dot (this is on a video display now, with a contrast ratio of around 18:1) against an average 22" viewing angle, the place where you can see a small dot better than any other size is 50 dots an inch. With this dot size you will always see the jagged edges on a display better than at any other size. Guess what dot size you have on the screens in your libraries? That's right--50 dots per inch. IBM has given you the worst of all possible dot sizes, and that ruins the illusion. The reason I get upset about this is that this was all known and recorded thirteen years ago but only Apple saw fit to make use of it. All we did is creep up to the place where the dot size actually made a difference in the clarity of the image, and guess what? It's only thirty dots away from what IBM is giving you. Only thirty dots--unbelievable! So with just a little bit more you get a fantastically legible display.

The other thing we discovered (along with other people, including some of my old buddies at the University of Utah, where the 3-D algorithms were done) was that video works a lot better than you think. One of the things we had noticed when we were thinking about computer displays was that there's hardly any bandwidth broadcasting video over the air. Yet you can sit at home and see a single hair on a newscaster's head on your Sony. There's no bandwidth at all on TV, compared to what we can do on a computer display. So why can't we put up a hair? Then of course, the first time you do the calculation you realize the hair is smaller than a pixel. It can't be there. But it is.

When the videocon spot goes trundling along in its analog fashion, if the thing it scans is thick, it will eventually get all the way down to black. If it's thin, it will pick up gray. Now, what goes out over the air? Something like a little feather. Take a magnifying glass and go up to your TV screen and look, 'cause it's really interesting. The images are not there. Your eye is kind enough to take these shadowy feathers and make them back into these coherent images. The hair is registered as just a little gray blur. And that is put back together by your visual system, to make that hair come right back.

Television works on less resolution than it should have, and it still works. Now, let me show you what the consequence of that is. What we're looking at here [on videodisc] is that idea applied to characters. You've probably noticed that characters don't look very good on television monitors, except on the Macintosh. And the Mac still does it the hard way. Imagine applying the same kind of blurring as we saw with the hair to a letter of the alphabet. Notice it's not a uniform kind of blur--the thing isn't just being de-focussed. What they've done with this character is to simulate what a television camera does when it looks at high quality text.

As you make the image smaller, mental filtering starts working, and the character starts looking like a real character. The result is that, even on an ordinary television set, you can do super high quality characters. The important thing about this is that it's all done on low resolution displays.

Most vendors don't even know about this effect, although it's fifteen years old. And the ones who do know about it have been hesitant to incorporate it in their systems. We use this effect all over the place on the new LaserWriter. If you've wondered how it can be the same laser engine as Hewlett Packard has, when it's literally a thousand times better, the answer is that the people who did the software for the LaserWriter were headed by my old friend, John Warnack, and he was one of the discoverers of these effects. On the Apple LaserWriter, not only is this exploited, but he also worries about exactly what happens when the laser hits the drum on the copier. If you understand that, then you can get incredible images.

Hallucinations

Unfortunately, you're only legally sighted in a two-by-three degree area. I think everybody knows that. Your eye is actually bouncing all over your skull, looking all over and putting together an hallucination that you think is a single scene. If you want to prove to yourself that it *is* an hallucination, just take two quarters and hold one up twice as far away as the other, like this, and ask yourself, "Is the quarter that's twice as far away half the size?" In fact, a half-size image is on your retina, but you'll see that quarter as at least 80% the size of the quarter that's closer to you. The reason is that we live in a dream. That dream is relatively one-to-one with certain characteristics of the real world, but in many, many situations, what we know to be true--namely, that the two quarters are the same size--overrides what is on our retinas.

You have to be in a certain frame of mind to be able to see perspective. It was lost for almost fifteen hundred years. McLuhan claims that perspective was reinvented after the development of the printing press. That was no coincidence. The book is that thing which you can take away and use to develop your own point of view. Before the book was around, you had to go into a social situation with others of your tribe and get the conventional wisdom. The Renaissance man was individual man; the medieval man was mass man. Mass man doesn't see perspective. This is true today in Nepal and in many tribes in Africa. That's why children draw all four legs of the table. They're drawing what the thing is, not what it is when seen from a particular point of view, which is what an artist does.

There's a great book, called *Drawing On the Right Side of the Brain*; it's for people who say, "Aw, I can't draw. God didn't give me the talent to draw." In fact, you can surprise yourself. Take a photograph of a face from a magazine, and try drawing it. You know it won't come out right. The eyes will be way up here, the nose will be like this; you've all seen those kinds of drawings. You've all done a few. If you just turn that picture upside down, and start drawing--guess what happens? You can actually draw a very accurate representation. The upside-downness of the image defeats what you "know" about faces. Maybe we should turn all these online displays upside down and take another look at them.

Here's one of the first window displays. It looks rather modern. (Now that IBM has Topview, windows must surely be obsolete. Once IBM blesses it, you know it's five years too late!) The history of windows is interesting. The single window goes back to Sketch Pad. Multiple windows were available in 1968, and the overlapping windows were first done in 1971 at Xerox PARC. (Now that IBM's doing it, we can be sure that there's something better on the horizon in somebody's lab.)

We use windows in lots of different ways. Windows are often connected to dynamic processes. A good example of the dynamic use of windows is for browsing. Browser windows came about because nobody could remember keywords. In 1972 or so, Lockheed Dialog was just starting to come out. I remember going over to see what they were doing, and we just about threw up. There was this huge manual, with all the keywords you had to remember in order to do a search. We couldn't believe it! What we wanted was something more like the stacks of a library. In fact, we really wanted any action taken by the user to create a halo of new options to choose from--like a hierarchical database. The system should dump all of the "hits" that are related, according to some criteria, into the next pane. If you pick one of those, a deeper layer is exposed, and so forth. What's retrieved is not static but a working circuit.

Just imitating paper indexes is a bad idea, because you can invert natural language terms to get much better retrieval. LEXIS showed us how to do good, inverted, full-text retrieval.

One of the things we've already talked about is that we live in an hallucination. It's the hallucination that is manipulated when we go to the theater; we suspend disbelief. Evolution can tell the genes very little about the world, and the genes can tell the developing brain still less, so we grow up with a brain that doesn't know what reality is supposed to be. Human mentality is also fragmented. Different areas of the brain have been specialized for different tasks, and they don't always communicate with one another.

Agents

What we're trying to do with the system interface is amplify. We're not trying to give the user a prosthetic. We're trying to build an amplifier; trying to give him leverage. You get leverage on any system when the illusion the user has can be directly manipulated by that user. Whatever he thinks the system is, is what he can do with the system--no unpleasant surprises. There are two ways to get at that. Direct leverage is typified by what we now call interactive or reactive systems, like the Apple. The user is given an extension--a mouse--that enables him to dip his hands into the computer stuff and stir it around directly. Indirect leverage is where, instead of sticking your hands into the computer, you stick some of your psyche in. You bud off some of your own goals and imbed them in the computer as an alter ego. This alter ego is what we call an agent. This agent may work for you twenty-four hours a day, but you may only talk to the agent three or four times a month.

I'm on the ARPA Network now, along with most of the other computer scientists in the country. Something interesting happens and someone gets moved to sit down and broadcast a message to two thousand other scientists on the network and say, "Hey, my graduate student just did blahblahblahblah." What's great about it is, they not only say blahblahblahblah, but they let you see that graduate student's paper, all of it; you can print it out. You now have a paper a couple of seconds after you hear about something neat. That's exactly what I want *except* I don't want to rely on those two thousand scientists to take the initiative. I want my computer "agent" prowling for new material. I want retrieval to happen automatically whenever something germane is put into the database. It's quite easy to do. Any system can do it almost for free.

Agents do all those little things that I don't want to have to remember. When I send mail to somebody, I don't want to have to call him on the phone and say, "Didn't you read my mail?" I want my agent to make sure the guy reads it, or find out why. When I want to have a meeting with somebody, I don't want to talk with this guy. He doesn't know his calendar any better than I know mine. We want to have our calendar agents fight it out--make excuses to each other, juggle things around.

Agents are a "new" kind of user interface. The idea first surfaced in 1958, but nobody has figured out how to do reasonable agents, yet. Don't believe what the A.I. [artificial intelligence] people tell you. They still don't know how to do it. But, in fact, there are some ways for a system to appear intelligent without violating the principles of user interface.

Let's think about what an agent might be like. Your illusion is going to tend towards thinking of the agent as a sentient being. Since it isn't a sentient being, it's going to violate your illusion all over the map. So, an agent is a very bad idea in terms of user interface. How can you get around that?

Okay, here we see a person. He's sitting in the chair, addressing his computer agent. [Film shows a man facing a wall-sized computer display, a map of the Caribbean.]

(User). Pay attention. (COMPUTER VOICE). GO AHEAD. Create a blue hotel. WHAT COLOR? Blue. WHERE? There.

Kay: Notice, when he said "blue hotel", the system didn't understand him. It didn't come back and say "repeat." The intelligence in this system bends over backwards not to have to ask you to repeat the whole thing. In fact, it recognized almost everything he said except the adjective, so it came back and asked, "What color?" The critical thing about this interface is that it carries you along with it, like a friendly but slightly deaf butler. It uses as much context as it can to ask you a reasonable question.

(User) Create a Red Atari. WHERE? North of Havana. Create the green water. WHAT COLOR? Green. WHERE? There. Put that...WHERE? There.

Kay: He's wearing a wristwatch that knows where his hand is in space. That signals locations on the map to the system.

(User) Put that...WHERE? There.

Kay: In the home, and very likely in the libraries of the year 2000, computers will not be visible. They could become part of our clothing or become integrated into the house. Remember, you don't see any of the electric motors in your house. You don't see any of the house wires--they're all in the walls. Perhaps your computer will simply be an I.D. bracelet that you can have either on or off. If it's on, it's like cellular radio. Whatever computer is nearby is addressed by your agent, and your conversation leapfrogs along, behind the walls. You don't have to speak to a strange computer. You speak to your own agent, which in turn knows how to speak to various systems on your behalf. Your agent is following you as you walk along. There's a shadow computer world that's getting more and more in one-to-one correspondence with our physical world.

(User) Name the hotel the Del Monte Hyatt. Move the Del Monte Hyatt. WHERE? To the Bahamas. Change your voice. (HIGHER VOICE) AS YOU WISH.

Kay: Of course, you want the agent to be customizable.

(User) Name that "Next Year's Meeting." WHERE? Jamaica. WHERE? Jamaica. Create a red cruise ship. WHERE? There. Name the cruise ship "Corporate Research."

Kay: Boy, talk about prophecy! We have a saying: "The research goes on; only the sponsors change." Now let me show you a much smarter version of that.

(COMPUTER "PHONE SLAVE") HELLO, CHRIS'S TELEPHONE SPEAKING. WHO'S CALLING, PLEASE?

(Caller) This is Jeff Kiest.

WHAT'S THIS IN REFERENCE TO?

I'd like to obtain some information about the phone project at the Architectural Machine Group.

CHRIS IS NOT AVAILABLE AT THE MOMENT, BUT HE LEFT THIS MESSAGE. (Chris's Voice) I'm out at a lunch appointment. I should be back in my office after 2:30 this afternoon.

AT WHAT NUMBER CAN HE REACH YOU?

Area code 315-667-7900.

WHEN WILL YOU BE THERE?

Any time after six this evening.

Kay: This telephone system really doesn't know what's going on. But we know that one of the reasons window interfaces work is the control of context. When you move from one window to another, the system knows what context you're trying to deal with. We're trying to do that here. The system doesn't know what the caller is saying. What the system is doing is computing away like mad, making a hesitation model of this person's speech. It's trying to figure out, is this person a hesitant speaker or a confident speaker? The only way it can interrupt him without angering him is if it knows that. If you interrupt a person sweetly and at the right point, and ask him a question, he will almost certainly derail whatever he's doing in order to answer. Twenty years of getting our knuckles rapped is helping us in this design.

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The system is the agent of Chris. It has a whole list of things that Chris wants to find out from anybody who calls him--all sorts of different variations. The system is trying to wait for an opportunity to leap in and ask the next question. Every time it does, it gets a response; the shorter the response, the better. It can pigeonhole each reply in a summary of responses to replay when Chris gets back. When it asks the telephone number, the response can go into a slot called "telephone numbers," to display to Chris later.

Question: What will happen if, in response to the question about the telephone number, the caller gives an address?

Kay: Yes, you can lie to this system, but most people don't. You have to fight it to lie. It's very dutiful, very good at insinuating its way back to what it's trying to do. Also, it has nothing to do all day except answer calls. It has almost twenty-four hours in which to compute. And in those twenty-four hours, it says, "Well, let's see if I can find a telephone number in this audio message after I asked him for his telephone number. I'll bet there's one in there." With that amount of time, it almost always gets complete recognition on people's names, telephone numbers, other kinds of things. It doesn't have to do that recognition in a short period of time. Again, this is theater.

(PHONE SLAVE) CAN I TAKE A LONGER MESSAGE?

(Caller) Yes. I understand that you're working on a telecommunications system that uses speech recognition to identify callers, and I'd like to obtain some copies of any work you have published in this area.

I'LL MAKE SURE HE GETS THAT. THANKS FOR CALLING. GOODBYE.

Kay: This system is 99% user interface design. It has no A.I. in it at all. What it tries to do is engage the user, to control the context. It's also fun.

Here's another one. How do you defeat anthropomorphism in the interface? Well, one way is to use a cartoon character for the agent. Here's an example of a thing we did with one of the presidents of Warners, back in happier days. [Film shows a TV screen with a cartoon agent, responding to questions from a group of users.]

(AGENT) HELLO THERE.

(User) Manny, are you in there? Can you help us out? We're in the middle of a hot argument about World War II.

(AGENT) LET ME TRY TO TAKE A LOOK AT IT TONIGHT AND LET YOU KNOW.

(User) No, no, we're in a big rush. We have a bet with Apple.

Kay: Notice that when they mention World War II, the agent says, "Well, let me take a look at it tonight." What that is feeding back is, "Gee, that is really complicated and I don't know." The idea here is that you want the person who asks the question to be constantly reminded that this agent is not an oracle. It's more like a librarian. It knows the lay of the land, but it will constantly try to defuse any direct question. What the system is trying to do is put the expectations of the user in a place where, no matter what the user does, what the agent does in response seems reasonable.

(User) Okay, so our question is, couldn't we have invaded Europe earlier?

WELL, YOU'RE DEAD RIGHT...EXCEPT WE MESSED THAT ONE UP.

Why would Hitler invade Russia?

HE IS A COMPLETE BANANA. HE DRIVES ANY ORGANIZATION TOTALLY CRAZY, SCREAMING AND SHRIEKING AND CARRYING ON.

Could you show us?

OKAY. [Film shows a simulated battle.]

Kay: The agent here has found an appropriate battle simulation in the computer "library." It doesn't want to answer the question directly, and knows that nothing is more boring than getting a dry history text. So, what it's retrieved here is a game, one of the best games that Atari ever did, called "Eastern Front". It's not a video game in the shoot-em-up sense. It's a strategic game that gives you a very good feeling for why Hitler could not win.

What you want from a library retrieval system is the appropriate response. You don't want just the easy response--you want the appropriate response. In this particular case, a computer game happened to be the best possible response. A physics question about say, springs, might best be answered with a film clip or a diagram. For questions where text is appropriate, the user should get text. The system should always attempt to produce appropriate displays.

Our original thought on this particular agent/interface was Ludwig von Drake. Remember the Disney professor who was always falling over things but somehow manages to impart the information anyway? This experiment isn't completely successful, as you can tell. What we're looking for is some way of constantly resetting the natural tendency of users to impart magic to the system. As soon as they do that, this thing won't do what they want. It'll fall completely on its face.

User Interface Principles

This next picture is my "lest we get too proud" slide. The Renaissance people said, "Man is the measure of all things." We tend to think the things that we do, like cities and computers and libraries and so forth, are fairly complicated. I used to be a molecular biologist; I want to show you an interesting thing. This is one intestinal bacterium, one five-hundredth the volume of a standard mammalian cell--just a tiny, little thing there. Inside of that E. coli is a hundred billion bytes of information storage--two million Atari 800 memories; fifty thousand two-megabyte Lisa Software Systems; two hundred hours of digital music; six hundred Louvre paintings--all inside one E. coli.

The systems that we're working on may seem complex to us, but in fact they are very simple. The only problem is, we don't know how to build them. We're exactly where the people were in the Middle Ages when they wanted to build huge cathedrals, and they wanted the light to come in. Well, the light didn't come in; they had all these big, thick walls. And people worried about that. The Greeks probably worried about that. Have you ever seen a Greek temple? The Greeks were pretty smart, but they didn't solve this problem. You have to be more than just smart to get an arch. You have to be lucky. This is a perfect example of a saying I made up some time ago: "Point of view is worth 80 IQ points."

Okay, so let's look at some semi-religious things here. This is our catechism we used to mumble to ourselves. Whenever possible,

- Make it concrete rather than abstract; visible rather than hidden;
- Modify something that's already there rather than making something from scratch;
- Choose something that's there rather than filling in;
- Recognize something rather than generating it;
- Edit the thing rather than programming it; and
- Do it interactive rather than batch.

I'm sure everybody believes in these principles by now.

Learning is most powerful when people actually do something. It's least powerful when we just tell them about it. Showing them falls somewhere in the middle. Actual contact with the system is very effective. The more the user can do concretely, without relying on abstractions, the better. And the more often the user has performed an action in one context, the more likely he is to remember that action and its consequences when he needs to do something similiar in a new context. We call this "the thin edge of a long wedge." That's what education is all about. The best user illusion carries people along very gently, relating new things back to things they already know, so they don't seem totally strange.

There are several key elements in a successful user interface (Figure 1). Immediacy is important. Whizzywig is important. Whizzywig means what-you-see-is-what-you-get. Remember, the reason you can build theater sets out of cardboard is that the audience can't get up on the stage. If you were to allow the audience to get up on the stage, you'd have to do a much better job on the sets, like in Disneyland. The required level of whizzywig depends on what you're trying to do. But the system should always be whizzywig.

From that standpoint, we could criticize the Macintosh. Overlapping windows are not always whizzywig. They seem to be, but think of it from this standpoint: You have a Dynabook--this little, two-pound, super-computer. You use it instead of print. Then windows are a heck of a good idea. They give you many, many portals into this huge information space that the computer surrounds. But if you're in a situation where printing is your only output, then windows are terrible, right? Because nobody prints a window. Therefore, windows are not whizzywig. If what you will get out of the system will always be a document, you should develop the user interface to correspond to the concept of a document.

FIGURE 1: USER INTERF

- IMMEDIACY

  WYSIWYG-"What You See Is What

- MODELESS

  Always lets the user start wit

- GENERIC

  What works in one place, works

- USER ILLUSION

  Most guesses are valid

- COMMUNICATIVE

  Reactive
  Proactive
  Help

- UNDOABILITY

  Unlimited playback & forward
  Crash protection

- INTEGRATED

  "Representation", "OS", "Langu
  Interface" are ONE

- DWIM--"Do What I Mean"

  Forgiving
  Guaranteed replay/recovery

- ADAPTABLE

  Kits, etc.

- FUNCTIONAL

  What will it do without user

- FUN

  Encourages the user to fool ar

R INTERFACE PRINCIPLES

Is What You Get"

start with a new command

ce, works in another

d

forward

", "Language", and "User

very

t user programming?

fool around even with no goal

Systems should also be communicative. They should tell the user what he wants to know. That raises an interesting issue about online help systems. Users need help when something goes wrong. But people won't buy a system that goes wrong every day. Some glitch that happens once every two or three weeks is acceptable. If you don't understand what's going on more frequently than that, you don't need help, you need to find yourself a new system.

When the user starts using help, he's forgotten how the system works. Not only that, he's in the worst possible mental state to learn. Say he's been sailing along, happy as a bird, and all of a sudden his hard disk crashes. And he hasn't backed it up for at least ten days. All he wants to know, very quickly, is whether there is a chance of salvaging what was there before he did that fateful thing that reinitialized the disk. When you have a user in that state of mind, don't have the system bring up an information retrieval system and try to get him to use Boolean expressions or some vast manual to find out where he is and what to do. It's a loser. It's exactly wrong.

Modeless doesn't mean "no modes." Modes are very useful because they give a context to the things that are happening automatically. When you go into a window, you're going into a mode, aren't you? What's harmful is if you have to do anything to get out of that mode before you can do your next command. A modeless system always lets you start the next command you want to do, regardless of what state the system is in at the time.

Let's skip to the bottom of the list--FUN. My biggest complaint about windows is they aren't enough fun. They lack that Disneyland characteristic. They aren't doing enough; they're just sitting there. Apple systems are not interactive systems, are they? They're reactive. The system gives you a lot of things that you can do, and offers ways for you to do them; you do something, and it'll go "blblblblbluh" and send you a new set of things that you can do. It's not interactive. A truly interactive system shares the initiative. It doesn't just come back. The system should be thinking along with the user. Fun is part of the interaction. Fun is critical because it helps us solve problems. A system that's fun is one in which the users are actively engaged all the time. What happens when we open the encyclopedia? We can't put it down. People are really information junkies; we can't help it. Our big problem is the "on" switch. We can't make people open the covers of all those books, sitting on the shelves. Once they do, then they're hooked. Fun gets users into the system quickly.

Generally speaking, every time we are willing to engage this medium as a medium, rather than as a tool, we win. When we start using it like a tool, we're subconsciously taking too many things as given. Remember, a tool is something we use on an existing medium. Its main purpose is to hold lots of degrees of freedom still, and allow us to stir other ones very vigorously. But the computer is a meta-medium; its content is other media. It can simulate images as sharply as they can ever be put on paper. It can simulate music. It can also do a whole bunch of other things that can't be done physically.

So, to leave that in our minds, let me try this on you; this is an attempt to create an entire world. Some former students and colleagues of mine are now at LucasFilms. For the movie Star Trek II, LucasFilms was commissioned to do the special effects. The plot for that movie turned on the idea of a genesis bomb. The genesis bomb was made to drop on a dead planet--an airless moon--and explode. Then a fire would spread over the surface of the planet, converting the dead materials there to things that could bear life. Mountains would come up, and trees and everything else. They wanted to show this in the movie. The Industrial Light and Magic people said, "Nope--too hard. There's too much scene detail involved." And the animators said, "It'll look phony." So, the computer people said, "Let us take a whack at it." And this is what they did. The music that I have here was not used in the movie. This music is composed by Wagner. It is an odd juxtaposition--imagine the Magic Fire Music going into Tannhäuser. It was all synthesized on a computer.

[Film of the creation sequence from Star Trek II]

What we have here is a very vivid way of remembering that the computer is a medium.

Jones: That's what an online catalog ought to be like.

Kay: Yeah. Not a single piece of paper was used on that. All the shots, including the earth and everything, were computer created. The mountains were actually "grown" by the computer, using a simulation of geological processes. Some of the frames in that movie, by the way, took as long as six hours to compute. There are a lot of pixels in the universe.

It was done on a fairly big computer, a Vax. This kind of thing can be done in real time now--with current-day computer equipment. All of the images there used the bit map display techniques. What was simulated was a much higher resolution scene, so that even when it was looked at by a television camera, the images came out perfect. Even the stellarium was computed, based on where this planet was supposed to be. You saw something like five thousand stars, and you saw the Big Dipper as it would seem from that vantage point; you saw our sun. This is really a nice job.

In five or six years, this level of computation will be available at consumer prices--for under ten thousand dollars. The amazing thing about these algorithms is that they are incredibly simple. There are a lot of pixels in the universe, so you have to do a lot of computations, but the computations are not tough.

Remember: the television screen is magnificently indifferent to where it gets its signals. If somebody can put all the signals in the right shape, we can put up all the images in the real world, plus ones that don't exist. Looking ahead, let me leave you with this thought: The Greeks said that the visual arts were the imitation of life. The computer arts are the imitation of creation itself.

VII. DISCUSSION GROUP REPORTS

Group A

Walt Crawford, reporter

We call our summary A Few Minutes with Group A (Our apologies in advance to Andy Rooney):

You know what we hate about online catalog displays? You go to sit down at an OPAC, and you see all these display and command abbreviations, and they don't seem to follow any rules that make any sense! They're just all over the place!

And then, you see these screens. Now, you get an introductory screen--that's fine, maybe--but you get these screens that have lots of words, all upper case. And we just didn't like that at all. Most of us didn't much care for those screens that are packed full of text. They've got text all the way from the top to the bottom.

Then, we find, you start using a system, and it calls itself a "page" on one screen, and then a "screen," and then a "frame." It says you're going to ENTER here and RETURN there. We just couldn't understand why those designers couldn't keep the terminology straight, even in the same system.

One thing really got our goat! When you do something a little wrong the system comes back and judges you. It says, "You gave me an invalid index." Or, "You did it wrong." Some of them are subtler. They don't use those messages; they use exclamation points or punctuation to let you know you're not really doing a very good job of using their system.

We don't really want the system pretending to be another person. And we don't want it spending too much time joking with us. Anthropomorphic humor is not appropriate. The catalog is a tool, and we'd like to tell it what to do--not have it tell us what to do.

Then we get function keys and menu options, which are fine. But when you use a function key or a menu option to get to the next screen, the system doesn't echo back what you did. We'd like it if it told us what we did, so the next time we could use the keyboard if we wanted to. Some systems don't tell you much.

Then, of course, some systems tell you too much. They give you too many choices. You say, "What is all this stuff? I can't figure out what I want to do."

We do like the system to tell us where we were, where we're going, and where we are; but not before it tells us whether it found what we were looking for.

One thing that really made us mad is that, once in a while, when you get into a system, you start doing searches, and you maybe get distracted a little bit. Then you look at the screen and say, "Now, how did I get here?" And sometimes you just can't figure out how you got there. And if you can't figure out how you got there, you're probably not going to be able to get back there again. Sometimes you can't figure out how to get out of where you got to either!

It's nice for a system to tell us things and to give us help, but sometimes the help message is a bit long--more than one screen of text. Seems like you should be able to say what you have to say in one screen. It's not like pages of a book; it's not like multiple catalog cards. It takes a little longer to flip back and forth on a screen. It's also impossible to hold screens together to see how you're getting from one to another.

Options are nice and menu choices are nice, but sometimes they're not complete. You get the set of options and you say, "But I wanted to do something else." Or, worse than that, sometimes there's more than one choice on the screen that seems to mean the same thing! When you can't make sense of the choices, it's really hard to choose.

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Our last gripe: it's really strange to get line numbers running down the left side of the screen when they're not in order! We don't know what you're doing inside the machine, but we really don't want to see those things.

Well, that was our "Few Minutes with Group A." What we are basically saying is that the systems aren't too bad, but all of us want to make them better. What can we do for future action?

1) One really important thing would be a pamphlet--a well produced, medium-sized pamphlet that could be reproduced inexpensively. It should cover do's and don'ts, with examples, for vendors and librarians. We could all use it to learn how to do what we're doing a little better. That's something the Council could help out with.

2) We thought we could go to ALA and hold a hearing. It could be sponsored by one of the discussion groups or committees. We were even thinking there might be enough material here to be worth a conference.

3) We were not enthusiastic about trying to settle yet on a common set of displays across all systems. However, we did think that it was a reasonable time to start work on a glossary or thesaurus, so that we could all start talking about things the same way.

4) Finally, we did think there is a need for continued research; we specifically want real-world research on real online catalogs under, if at all possible, controlled conditions. We need to see which of these display options and techniques are important, and which do and don't work well.

Group B

Brian Nielsen, reporter

We spent the first half of our time together deciding what our focus was, and the second half, after Alan Kay's talk, deciding that everything we'd decided in the first half was wrong. Our major points were:

1) We talked at some length about whether we were trying to focus just on displays, or on the whole structure of a system of commands. When it comes down to it, it's hard to pry those two aspects of the interface apart and talk only about displays.

2) What frequently happens in real design situations is that there are trade-offs, or two rules apply in a particular situation and you have to choose one or the other. There need to be algorithms to work out possible rule conflicts.

3) There are a number of very specific issues we'd like to see addressed:

   . What is a reasonable practice for the display of added entries in a full bibliographic record?

   . How can we settle some vocabulary problems? We also thought a glossary would be very useful at this point.

   . What suggestions can we come up with for the display of non-book materials? Some people already have displays for monographic materials and are working on serials. Some people are further along than others, and must address films, maps, etc. Those displays may be more radical than the displays we've done for monographs--maybe more useful in some cases.

4) We had six specific suggestions for research:

- Hire users to do something similar to what was done here on Monday. Gather a number of real, live, operating online catalogs that are available in the marketplace, using real, live data. Hire users to come in and comment at length on features they liked and didn't like, problems they had and didn't have. Do this in a number of cities so that you could get some sort of cross section. Pay the subjects enough so that their time would be well spent.

- Concentrate more on performance research than preference research. It doesn't help us any to find out that users like everything.

- Find out in some systematic way what libraries with online catalogs are doing in terms of their own market research. How are they serving their users? We know that some libraries have CLR funding to use the online public access catalog survey instrument; there are probably other instruments around. It would be nice to have some way of getting some information together on their findings.

- Develop a list of those things that we have consensus on--such as the amount of space that is to be filled up on a screen, or how bibliographic records are to be labeled, and so on.

- Study ex-users. The large online public access catalog study systematically excluded ex-users. That's a group that we really need some information on. Why did they quit?

- See what users call data elements rather than what librarians call data elements.

We also spent some time cogitating about Alan Kay's talk. We felt he said a number of useful things although he was kind of distracting from the nitty-gritty that we have to deal with. Among the questions that came up in response to Kay's talk:

- Do we need very different interfaces for different kinds of searchers?
- Do we really want to call what we have an "online catalog"; does the word "catalog" limit what we want to be doing with that interface?
- Do we want to look at different approaches to orienting people to our systems?

At the same time, the amount of money that libraries have to spend on catalogs is nothing like the money that Atari has to spend on talking walls!

Group C

Steve Bulick, reporter

We also spent a good deal of time talking about the separation of screen displays from other design issues, when in fact all the various aspects of user interface interact quite strongly. When talking about screen designs, you must also talk about the tools and techniques for guiding people through the system. Our main points:

1) We decided that the screens used to guide people through a system were difficult to discuss--they were very controversial. One thing we could say something about, however, is the bibliographic record:
   - We need guidelines for labeling and presenting that record; we want them in a hurry. We feel that the Council could commission some work that could address this problem relatively quickly.
   - We specifically need guidelines for translating MARC elements into a human, intelligible display.
2) We expect to standardize within systems, but not necessarily across systems.

3) We felt that CLR could commission some people to analyze all of the available systems and present results and comparisons. The emphasis should be on very practical guidelines.

4) Another possibility might be a directory of available systems who were willing to provide dial-up access. We could look at other people's work, see what they are up to, and steal their good ideas.

4) Another issue is the design audience:

   - Are we obligated to design for the lowest common denominator?
   - Should screen displays reflect user differences?
   - What trade-offs are available between simplicity and power? When we make a system more powerful, it automatically becomes more complicated. It also gets much harder to present the available alternatives in a way that is intelligible to everyone.
   - We must look at user needs, particularly in the area of "help." What should the help message say?

5) We'd like to see some work on the relationship of the display strategy to human memory performance.

6) It might be interesting to look at what users have in mind when they come to a system. What do they want to find out? What do they expect the system to give them?

7) Finally, there was a strong recommendation that existing human factors research, of which there is plenty, should be brought to bear on some of these online catalog design issues.

Group D

Linda Arrett, reporter

First we tried to identify the goals or uses for an online catalog. We identified nine--and then tried to link our possible recommendations for standards to those nine.

We also asked the general question, did anybody in our group of ten feel that guidelines or standards should not be set now? There was some feeling that perhaps it's too soon. Then we asked, would we lose anything if we developed them now? Would we be stifling any kind of development? We did agree on the need for some common terminology.

We thought we should draft a set of guidelines for some areas, and a set of requirements for more research in other areas. We immediately realized that we need to become more familiar with the research that is already available. Chris Borgman's chapter in the *Annual Review of Information Science and Technology* (ARIST) is a good example--we all have ARIST in our libraries, but we sometimes don't get around to looking at it. Maybe all of us need to get a mailing of that chapter.

We decided that, rather than make direct statements (there should be a standard here; there shouldn't be a standard somewhere else), we would pose a series of questions. The following questions and comments relate to each of the various functions of the online catalog.

Function 1: Identifying holdings in a collection:

- Do we need a standard that might be different for materials of different formats? Should the holdings for a film be displayed differently from the holdings for a serial, a map, a Braille book, or whatever?
- We did decide that we probably should have some standards for labels in a holdings display.

Function 2: Identifying the status of particular holdings in a collection:

- Should the status be automatically displayed?
- Should it be displayed in a standardized format?
- What terminology should be used? Should it be a positive statement or a negative statement? "This book is in the library; this book is not in the library; this book is not available."

Function 3: Traditional card catalog functions--collocation, etc:

- Should the Paris principles, as we all know and love them, happen automatically in a display of records online?
- Should we try to show an entry first, or should we try to show an authority record, brief or full, before we show the bibliographic entries that match the user's query?
- How and when and where should cross-references be displayed?
- Should the cross-reference information--the Broader Terms, See Also's, Sees, Older Names, Newer Names, whatever--be displayed in a standardized format?

Function 4: Producing products: bibliographies, printed catalogs, etc.

- We decided not to deal with this at all at this time.

Function 5: Allowing the user to choose his or her own level of information for display:

- Should there be a standard among the choices? If a user chooses the briefest, should there be a standard for the briefest?
- Should the user be able to construct his or her own preferred formats for brief, middle, and full display?

Function 6: Searching and sorting flexibility:

- Should there be a standard that identifies the particular sort that should be used?
- If you've done a sort by call number, should there be a standard for displaying information about what criterion you used to sort your search results?

Function 7: Providing more and better assistance at the point of need:

- Should help screens be displayed automatically if a certain error condition is generated? Some users may need this assistance since they're using different systems--or different terminals--to get at the same databases.
- Should help be requested by the user?

Function 8: Remote access:

- Must we retreat to the lowest common denominator in this case? What do you do with a standard that includes color displays but a remote terminal that can't accommodate color?
- If you have a function key on a terminal in the library and you don't have a function key on the terminal that someone's using to dial up, how can you implement standards?

Function 9: Giving clues to other resources (other databases or other reference sources in a particular library):

- How do we alert the user that these resources are available?
- Should this, in fact, be a function of an online catalog?

DISCUSSION

Jones: The most obvious element that came through in all four groups was the need for work on a glossary of terms. Let me ask a fundamental question--developed by whom? How does one start a glossary?

Bulick: We thought you might study existing systems to see what they're already calling things.

Crawford: One approach is to compile a thesaurus of terms that are currently being used. We also need to know to what extent the same term is being used for different meanings, and to what extent different terms are being used for the same meaning. A standard glossary would be a second step, after that.

Salmon: I wouldn't stop there. I'd try some of these synonyms out on the public and ask, "What does that mean to you?"

Borgman: I'd like to hear Charles Hildreth's response to the idea of a glossary. I know he attempted to build one. What he's already done might be a good starting point.

Hildreth: It would certainly need to be expanded and kept up to date.

I have another comment: when we talk about a glossary we need to talk about scope. Where do we cut it off? Do we limit just to screen displays? Do we attempt to cover the entire interface? The world of information retrieval is vast.

Arret: Maybe we can follow up on a recommendation that came out of the San Antonio conference. Let's make copies of everyone's documentation, especially of the help screens. All the terms that are used will be right there. Researchers could use that to expand Charles' list.

Salmon: I hate to throw a wrench into this suggestion, but our screens are protected by copyright. I'm not sure all the vendors would want to copy all their documentation, since that would constitute publication.

Michael: Our group talked about starting with a glossary of names just for the MARC field tags. Somehow we're going to have to translate the MARC field tags into something meaningful to the public. That's one way to limit our scope.

Ritch: I like the idea of a central clearinghouse for documentation, but I think we can do something more specific than just copy screens. Could systems be invited to submit lists of terms, with definitions? If those dictionaries were merged I think we'd find some startling variations that we haven't even seen here at the conference.

Crawford: I'd hate to limit it even that much. Many of these issues aren't thought of as problems of terminology by the system designers. If you already had a working glossary just for your own system, you would never call something a screen in one place and a frame somewhere else. I think you really do need to make this glossary as broad as possible without getting totally out of hand. I'm not sure what the cutoff point is. Reviewing documentation and actually looking at the systems is the only way to handle it.

Nitecki: We shouldn't make this list with the expectation that we'll pick just one term out of all those that are listed, and that will be the one to use. We need a thesaurus, not a glossary.

Borgman: I'd like to add a note of caution about the attempt to go around and see what users name things. There was a series of studies at Bell Labs that tried to do exactly that for word processing systems. Do users "erase" a word, "delete" a word, "omit" a word, etc? They found that there was so much diversity in responses as to be no clustering. The odds of any one person's calling the same thing the same name twice were about 0.3. And the odds of any two people's naming something the same were about 0.08. You can spend a lot of money looking for that common word--it just ain't out there! At some point a decision is going to have to be made.

Bulick: That work was an attempt to arrive at some commonality in command names and parameters. You're right; it basically failed. That same group did some other work on an issue that you'd think there would be more consensus on. They were trying to figure out a way to organize headings and subheadings in the Yellow Pages. It wasn't an outstanding success. They found wide divergence in people's attempts to classify things--which term should go where, what it should be named, etc.

Michael: I think an attempt to reach consensus would be wrong. The issue is, if you use a word, do people know what it means? We're finding that people don't know what "imprint" means. But I think that they do know what "publisher" means. They know "author" but they wouldn't know "main entry." We may not have to use the same word. Is there some way to tell if the words we are using are understood? That's very different from consensus.

Crawford: I think that's a valid issue. I will admit that I'd be very cautious about doing a big user survey because I think you'd probably be talking about a very expensive process. I suspect that gathering a thesaurus would be a significant effort. Merely publishing these terms will give them weight. In a sense, as soon as you organize a list you assign values. Even the act of alphabetizing assigns some form of value, positive or negative. But by gathering these terms together you would find out which items have an extremely broad vocabulary and which don't.

Shapiro: I think the problem is broader than just what the user understands. There are terms that are similar from system to system, but don't mean the same sorts of things. "Previous" is a good example of what I mean.

Cheng: I would be very careful when defining terms, to avoid technology-dependent words. Let's not encode things that will limit our ability to exploit new technology as it becomes available.

Jones: I'm beginning to wonder if what's required is that somebody just get on with it. Maybe someone should just do it, despite all the caveats and cautions that people throw out. But I have a hard time seeing this as a funded project. Somebody might take this on as a professional task, on their own hook. We need a champion to move this product along. I don't see this as happening in a committee environment.

Lipow: I think that the purpose of getting together to talk about guidelines was a marvelous excuse for being able to just look at each other's catalogs. I'm not sure there ought to be guidelines. I now know ways to suggest improvements in my own system--I think each of us is going home with ideas about how to improve. But when it comes to a guideline to stay away from clutter, that's been written about before; we all knew that. I think the value of this meeting was simply the ability to see all these systems together, to compare them. Besides, we can't agree on many of these issues.

Matthews: The purpose of a guideline is not to convey a consensus of opinion. Whether this group agrees or not is not important. A guideline is simply the application of research results. What we think doesn't really count.

Shaw: We need someone to pull together that external research, and organize it in such a way that those of us who are making design decisions have the benefit of looking at it. Call it "principles," not "guidelines." "Guidelines" is a loaded term.

Jones: I would like to point out that when you finally see Joe's printed paper he will, in fact, have a relatively extensive bibliography. Chris Borgman noted that the ARIST paper she prepared also has a relatively extensive bibliography.

Arret: I think it's safe to say that most of the research, though not all of it, is not in the library field. Once we get a list of display elements that have been evaluated, maybe the Council could support research that applies some of those findings to library systems. Libraries are probably willing to spend the time and money to do small-scale research.

Jones: You'll all be happy to hear that the Council, outside the Bibliographic Service Development Program, is starting a research institute. The institute is a very broad-based, heavily funded, long-range effort to improve the sorts of research required by librarianship. These are the sorts of topics that we are going to be looking for people to focus attention on. The research institute is going to fund individuals or collections of individuals to attack a particular problem.

Michael: I don't think we can have it both ways. We can't ask for research and then complain once we have the results that someone is forcing us to do it this way. I don't think Joe said, "You are forbidden to do this" or "You must do that." I think he said, "Here are things I have looked at and research that applies to the online catalog." That's not threatening. Sometimes as a designer I felt slightly ashamed about work I have done, but I try not to take that personally. Any time you ask for research, and somebody presents it, then it's very simple: you can say either "I will" or "I will not listen to that." What we are saying, however, is that in many cases we need to know more. It could be that some designers have been more aware of the user than I have been.

Hildreth: I'll come back to the term "guidelines." I don't mean to suggest that we are just hung up on semantic problems because we clearly are not. But we are still confusing a fundamental issue. Standards and guidelines are not the same thing. There are all kinds of guidelines--some are more precise than others; some are based on research, empirical and otherwise. In this country, "standards" means something very specific--in terms of process, specificity, logic, application, etc. There are lots of guidelines that will never become standards. Yet here at the conference we've been using these terms synonymously. Guidelines are simply suggestions, not standards. I think that some of us who might feel threatened or unsure, who say "I don't want to be forced," are really thinking about standards. Guidelines are simply the best information we have about a particular issue to date.

Crawford: Instead of "guidelines" or "standards," our group came up with "suggestions." This research is being done and has been done. What is missing is work that will bring it all back home. The average vendor or librarian doesn't want to read a bunch of books on research findings and articles on human factors. What they would like are some suggestions about how those findings relate to online catalogs, with examples. That would get a much broader readership and would have a much broader effect than attempting to do a better job of showing where the research is already available. We want someone to interpret the research.

Norman: We also need help with analyzing and balancing the design trade-offs.

Jones: We are about to switch topics. One of the topics we have not heard very much about is future directions in online displays. Where are we going from here?

Nielsen: One of the issues that arose several times is the relationship between local databases and more centralized databases--union catalogs, etc. We need protocols for linking.

Hamrick: I'd like to see more work on the issue of how we move users from screen to screen. Are the paths going to be the same for novice and expert users?

Borgman: We are going more toward intelligence in the front end and toward more graphics-oriented displays. That forces an even stronger distinction between standards and principles. We can't possibly set standards for technology that changes very rapidly. New kinds of displays are bringing new conceptualizations of the user interface. For example, working with a mouse is an entirely different type of dynamic interaction than working with a keyboard. To support different types of terminals, we may need to focus on an absolutely rudimentary set of guidelines. On the other hand, to optimize the user interface, we need to tailor each system to take best advantage of all the available hardware capabilities. How do we cope with this? We have more questions than answers at this point.

Michael: We are going to have to provide options. If we want to provide dial-in searching, backwards scrolling and reverse video may be out of the question. One set of guidelines will not cover everybody and every kind of terminal, but listing a set of alternate choices may not be that difficult. Again, there are trade-offs.

Allen: The consensus here is that we can't come to a consensus.

Salmon: I am assuming that the goal of this conference was to have better online catalogs for users to use. I think that as a result of this conference, every online catalog represented here is going to do better, to improve. We may not be ready for guidelines on all of these issues. When we do have available research results, as Joe has indicated, let's turn that into a guideline. But where there is no good empirical data, let's postpone the development of guidelines and concentrate on research.

Larson: This conference has also helped us focus on the issues of distributing our findings. We need to keep in touch with what other people are doing.

Jones: I suppose it's not beyond the realm of possibility to have a whole set of screens stored on an optical disc, on a very modest micro system, for review and analysis in different library settings.

VIII. CONFERENCE SUMMARY

Joan Frye Williams

To begin, I will speak briefly about the notion of guidelines per se. The last three days have been a wonderful study in the diplomacy of definition. It is clear that "guidelines" is a loaded term. Some people were concerned that guidelines would be restrictive and would stifle creativity in an industry that needs all the creativity it can get. Some people were afraid that guidelines would be too vague; some were afraid that they would be too specific. Some people were concerned that the conference speakers were telling designers what to do, and others were irritated that no one would name names and get down to the real nitty gritty and give specific advice. Some people felt that guidelines were similar to standards, and we all hate standards, right? Some felt that guidelines imply a least common denominator. Some felt that they imply the greatest common denominator. And some were quite certain that there is no common denominator.

There is a lot of baggage that comes with this terminology. Lee emphasized that a guideline is a range of acceptable options. But we are still muddled about how to define a range, and about what's an option and what's acceptable.

There is nothing that is true for all systems and all users at all times. I would like to suggest that "guideline," loaded term that it is, means essentially whatever gets us closer to an online catalog that works, and works well under a variety of circumstances.

In the three days that we have been together we have approached this problem from a number of directions. We have had actual demonstrations of the systems, brief though they were. I think my time spent working with each system here at the conference was more useful than any time I have ever spent in a booth at ALA. For once I didn't have to worry about getting between a vendor and a prospect. That was nice, just to be able to spend a little time "test driving." Then Joe gave us a summary of related research and some specific suggestions. Fran gave us an interesting picture of the evolution of displays in a particular segment of the industry, and reminded us of how systems evolve. The concept of progress--nice, linear, A to Z development--is foreign to computing in general, and Fran's talk brought that out well. Chris and Kent gave us their critiques of the online catalog systems. (Of course, you all now have the desire to go home and do your own critique, so that you can make sure that it is done "right" this time, and all of the subtle nuances of the extremely elegant designs that you have so carefully nurtured are given full credit.) Together we have grappled with some of the issues that surround system design, worked on defining our problems better and on setting some agendas. Alan Kay gave us a view of what is possible if you have lots of money--I think that shook us up a little bit. The discussion groups reported that his talk helped them to back up and see a bigger picture.

Out of all this activity, I have some summary comments to make about 1) what we think we already know about screen displays, 2) what we would like to know, and 3) how we can find out what we would like to know.

What We Know

First, I don't think it's likely that there is an optimal system, a grand archetype--an online catalog in the mind of God; that if we just thought, prayed, and meditated hard enough we would be enlightened and see. I don't think there is a "best." There is instead a series of compromises. All of us know that our job is usually not choosing the best design, but deciding on the lesser of the evils, given a particular set of design constraints and parameters. The "right" answers can only be right for a particular time and a particular place; the "best" can only be the best we know how, given what data we have right now, today. We know that the design process should and will remain iterative. Whatever comes out of this conference needs to protect that iterative approach. The notion that we will fix something and it will remain stable is probably counterproductive, given the design process itself.

We know that there are currently no proven absolutes. There are general principles, but even those principles may evolve or, in fact, may be overturned in time, as the thinking moves along. We know that the screen display is by definition dynamic and fleeting, and we are very reluctant to compromise that by pinning it down in a point in time.

Instead of having all the current systems in one room, I would love to see one from each of the past fifteen years, all in a line. Is the Smithsonian doing that? Is someone protecting, collecting, archiving the interface as it evolves? Interface is dynamic; you don't get the same feeling from slides or snapshots of screens as you would from live comparisons.

We also know that the market forces that usually drive system design out in the real world are not the same market forces that are brought to bear on the online catalog, since the primary body of users is not the primary body of buyers. If we are designing for the public but the public is not paying (directly) for the systems, how do we balance buyers' and users' issues?

Given all of that preamble, I still think we do know some specific things about screen displays:

- Not too many people in this group will argue that an online catalog user needs both ease of use and effectiveness of use. Those may not always be the same thing. It may be harder to get a more sophisticated result but it may be a worthwhile investment, an effective use of the user's time.

- The user must, first of all, be engaged by the system. There are a lot of suggestions that he or she must be engaged fairly quickly. Fifteen minutes is too long; two minutes might be too long. We need to draw people in to use these resources.

- I think we agree that there needs to be some work on effective system metaphors--mental models--so that users who come to our catalogs can find their way around conceptually.

- I think we know that once they are in the system, users need some consistency and some predictability--but not to the point of never being surprised. Serendipity is also important.

- We need links between screens. In general, whoever is delving around in a system needs to be able to recognize where he or she is in order to get to where he or she wants to go fairly quickly and easily.

There may be some techniques already available to help achieve these desirable goals. They include labeling, "chunking" data together, not having extremely high density displays, adding column headings, using lists rather than blocks of text, and employing upper and lower case on occasion.

We know that "added entries" is definitely a suspect term, even though we don't agree on what to do about it. And, like Andy Rooney, a lot of us know what we hate.

What We Don't Know

There are a lot of things that we would like to know more about. We still don't really know enough about what *works*. I'm defining "works" as any screen display, or any feature that's integrally related to a screen display, that will enhance user performance.

- We especially want to know how to deal with the bibliographic elements of the online catalog because those are unique to our industry.

- We want rigorous empirical links between particular display characteristics or features and user performance and satisfaction.

- We want reasonable, valid research results that we can bring to bear on specific design problems.

- At another level, we also want examples of both effective and ineffective display techniques--what's working and what's not working.

- How do users learn? What is that "long thin wedge?" We need to know how people get into a system and move around. What exactly is the information retrieval process? I think, after listening to the discussion groups, that we are no longer certain that that process is conversational.

- We want to know if cross-system use is sufficient to warrant the establishment of user conventions, or whether we should be more concerned with in-system consistency.

- We want specific recommendations for specific situations: How do we handle "added" entries? How do we handle nonbook materials? What kind of "help" really helps?

Finally, we want to know which variables are really important and which ones will yield a good return on our investment in refining them. We need the information that will allow us to play the development percentages. If we need 200 things to make our catalogs better, which ones will pay off? Which ones will pay off soon? What would a reasonable investment be and where shall we begin?

How To Find Out

So, how do we find out some of this stuff? First of all, we need to analyze and disseminate the existing human factors data--there's no question about that. There have been some requests to evaluate the systems we do have, against existing criteria. I think we also need to agree on ways to measure what happens to the user. User satisfaction is an interesting indicator; it seems they are pretty well satisfied despite current shortcomings. Anything is better than the card catalog!

I would like to see us spend time exploring how we will measure user performance. How will we tell if we "done good?" How do we recognize success, other than when users say, "Yeah, I like it?" Are there statistical methods we can borrow from other disciplines that would allow us to measure changes in user performance based on variations in the screen displays? I think we want to spend some time thinking about and maybe defining what acceptable user performance is. Alan Kay says that a user needs to know what the system will do in thirty seconds, and what it won't do in two minutes. That's a user performance guideline. Is that the kind of target we want to set for ourselves? And if so, is that a legitimate target? As a population that was raised on video interaction grows up, do those thresholds get lower? We haven't talked much about that as a group.

We need to test alternative screen displays under conditions that make the screen itself the variable. De-interlacing the display from command language and other system features is difficult, but I think it can be done under controlled conditions. We need to know that, when we're talking about screen displays, that's all we're talking about. There was a lot of frustration with that these last three days.

I think we need to correlate what we suspect about screen displays with other kinds of data, like transaction logs, to see if we can find some linkages there.

We need to follow up and see what drove the nonusers away. Can improved displays remedy that or does nonuse have nothing to do with displays? I think we need to discover what it would take to capture the audience, to engage them.

We need to co-opt the results of the research that is done in what Fran calls "greed oriented" fields. Those are the industries that are investing in the kinds of major research and massive new technology that we may not be able to mount in our own profession.

We need to communicate with one another about what we are learning. We need to take specific steps to disseminate results. I love the idea of a directory of dial-in numbers so we could get a good look at somebody else's system. At ALA we are all too busy. I've also heard requests for hearings, conferences, glossaries, and newsletters--anything to keep those communications channels open. One of the biggest things that came out of this meeting is recognition that we are all in essentially the same business. Why do it all alone if we have the opportunity to share some creative energy?

More than anything, I think we just need to keep trying things until somebody gets something right! But first we need to know what "right" is, so that we stop and say "hark," and then disseminate that discovery to the rest of the group for comments or critique. I'm pleased that I've heard people say, "Based on what I've seen here at this conference, I'm going to go back and change something in my own system." Together we can make online catalogs much, much better.

IX. FINAL COMMENTS

[Conference participants were offered a chance to comment on the events and discussions of the last three days.]

Spigai: None of the systems satisfactorily indicated how to do Boolean "OR" logic. How can we make that simple for a novice user to understand and use?

Michael: This has been a really exciting experience. Hearing from people who are experts in their field gives me information I can use back home as I struggle with the practicalities of the user interface.

Shaw: I guess the most important thing that I would like to see happen as a result of this conference is some attempt to bring the external research on other kinds of online systems to bear on our problems. As we move from the display of bibliographic records to the display of direct information, an effective interface is going to be exceedingly important. We think we have problems now dealing with the surrogates; wait until we get around to displaying the real text!

Hildreth: One of my favorite maxims was uttered by a former president of Dartmouth College: "Things that go without saying generally need to be said." Most of those needed things have been said.

Potter: It seems to me that the systems that have been judged easiest to use are often the ones that offer the least information--the ones that concentrate on basic bibliographic records only. The systems that support word processing files, authority files, etc., seem to give us more problems. How do we solve that trade-off?

Shapiro: There were a few things that were repeated over and over again that concerned me a great deal. I would like to take issue with one thing in particular. Joe said that librarians are not in touch with users. That may be true in some libraries, but it isn't fair to generalize. Many librarians are in touch with what's needed.

Salmon: I'd like to say that I'm very proud of my colleagues, the other vendors. In light of the fierce competition in the automated library system marketplace, their willingness to participate in this conference and share detailed information about their systems is remarkable.

Cheng: These systems are still too much alike. I'd like to see more diversity, more use of different kinds of technology.

Larson: It was good to get comments on our system from experienced users. I also learned a lot about how to get changes to a system through the political process back home. We need to know much more about how people learn to use any kind of online system, and about how to get feedback to users who take the time to ask questions or make comments about our system.

Nielsen: We may need to get away from the notion of the card catalog, to an entirely new system metaphor. Maybe that would enhance the users' sense of being in control.

Ritch: I think I would have gained more if, like a good screen, I'd been given a couple of introductory statements. If those statements had come from Joe before we were barraged with sensory stimuli (the demos of the online catalogs) on that first day, I think I would have been able, a) to structure my responses; and b) to pay more attention to what the result of the search looked like and less to how you get there.

Borgman: I'd like to go back to the whole issue of trade-offs. I think we need external guidelines so we can apply the best of what's already known about making good systems, but I find that the internal consistency of a system is much more important than matching some across-the-board standard. I don't have data to say whether users commonly use only one system or many. (I would like to see that data.) I still think that most people use only one system. Internal consistency is the key to conceptual models, to engaging the users, to quickness of learning, to their sense of being in control. To get all of those things to fit together is still the most important guideline. And there's no substitute for research.

Bulick: I learned some very specific things. As a designer of a system, I'm going to go home and make some changes. My attendance here will have concrete results in the way my system looks.

Hamrick: What I'm going to take away from the conference is what I just heard Steve say. We just finished one iteration of the screen designs and we'll be doing another one in a couple of months. I will try to incorporate a lot of the principles that I've heard here.

Crawford: Fran's talk really revealed something that I think is important. In a relatively underfunded area, with a lot of different work going on, with very mixed levels of communications, by and large, the online catalog designers have done a surprisingly good job. There are a lot of things wrong with these catalogs, but there's a lot right with them too--particularly as compared with very large, very old, heavily iterated commercial designs out of the library field. It is my feeling that the online catalogs we saw here were more successful than BRS, Lockheed, or SDC. And that says an awful lot for the people in the library field.

Howard: I'm happy to have finally met all of these "big name" library automation people. My other comment is that, until we can define exactly who our users are and what they need, we need to design systems that are flexible.

Matthews: I'm delighted about all the interaction and disagreements that took place. It has been, as usual, tremendously stimulating. The other thing that strikes me is that some corporations are spending a lot of money on user-system interface design and screen layout research. I'm wondering if there is some way that libraries can tap into the results of this proprietary research.

Scanlon: In the next five years the dumb terminal is probably going to be an anachronism. We've got to use the new technology instead of being driven by it. My second observation concerns the emerging "high tech, high touch" society. I think we can do an awful lot to improve the "touch" of our systems.

Norman: Is the "agent" going to be the new user interface? Will that replace today's librarians? With all the changes in technology I think it's an exciting time for library catalogs but it's also a little scary.

Bisom: I agree with Walt--it's nice to know we're doing a lot of things right. Now the challenge is to go home and push for changes and improvements.

Radke: I come to these meetings to be energized. I now have the strength to go home and work on displays for non-print formats.

Freivalds: There have been a lot of good, practical suggestions on how to do "help" displays, etc. I only hope that the system designers who were not here will take the time to hear what we are saying.

O'Doherty: I'd like to express my gratitude. This conference has been very useful to me; it's been a consciousness-raising experience. I have enjoyed having the opportunity to see other systems. That is very difficult to do in the everyday world of conferences and competition. There has been an interesting trend in the last few months in the orientation of the vendors. I feel personally that our role when we interact with libraries is an educational role. But the educational role is much larger than providing product information. This kind of conference has allowed us to take the time to concentrate on design issues in a more academic environment. That is something we will be able to pass along in terms of increased sensitivity to the needs of the buyers of our systems.

Clapper: This was a wonderful opportunity for me to meet other system designers and to view other systems. I can go back with, if not a set of guidelines, at least a sense of the issues that other people are working on. I have now learned what sources I can consult.

McRae: This is my first CLR conference. I wasn't quite sure what to expect. I think I was expecting more of a working group atmosphere. In fact I'm pleased at the informality of the group, the friends I've made, the amount of practical information I've been able to get from the other participants. I was sometimes distressed that so much time was spent quibbling over terms and defining our scope. I believe greatly in the power of the individual to make changes. I think we are now all better analysts and better designers.

Johnson: I think it was great to take the time to focus on these problems, without outside distractions. I'm looking forward to visiting these systems in the future to see the changes.

Jaynes: As someone who was not a system designer, but was here to demonstrate a system for the first time, being here gave me some feedback on the system from other people. I found that extraordinarily useful. I too am going back with some rather specific suggestions to make. It's also been very useful to see some of the other systems. I must say I really enjoyed the challenge in Alan Kay's presentation. He stretches your mind, gets you off dead center and presents a picture of something that may or may not happen. It boggles your mind.

Logan: I think it would be great if we had the different catalogs available for a longer period of time. It would have been nice to see them at a more leisurely pace. One of the things we haven't spent too much time talking about was the ergonomics of these terminals. We have assumed that our users are going to walk up to the screen and use it for 5 or 10 minutes and then leave. What happens when a user is at the catalog for 2 or 3 hours?

Senzig: I want to urge everyone who designs systems to cooperate to the extent that you can. I'm in an academic library and 90% of my users have also used systems in other libraries. We have to help them make that transition. We need some consistency.

Dalehite: I came to the conference with some plans about things that I wanted to change about our screen displays. I feel really good about having had those ideas reinforced. I had mostly gut feelings about where things should be on the screen, and how to help the users identify what they are looking at. I can go back now with both empirical data and the collective experience of the people here. The conference has given me a little more authority than I had before.

SOLINET has a lot of restrictions that commercial vendors might not have. We don't have the same kinds of resources, the same kinds of funding options. We sometimes have difficulty figuring out how we are going to go about accomplishing changes. Plus, it has been mandated that nothing we do can affect response time. There are things we could do to improve the user interface that would eat into that response time. We are also serving users that vary from Emory University, which is very large, to a library that has only 400 patrons. Our screen displays serve all of those users. In some ways we have identified a common denominator. But I question whether we want to make that the lowest common denominator. I'm not sure we are educating our users if we keep the interface so simple. If they are not learning the power of the system that we have developed, they are not able to take advantage of that power.

Arret: I have three comments. The first is a complaint about the logistics of the conference. I think there were many of us who had the anxieties of getting systems up and running, who didn't have enough time to see the other systems. Some of us had trouble getting systems to work at all. If we had anticipated the problems with the phone lines we could have scheduled more time between demonstrations. Second, I think it's very important that any research we might be doing in our own institutions get out as quickly as possible. We might have a list of system telephone numbers so we can sign onto a system to see how it works. For my part, I will do what I can to get everybody summary statements of some research we did asking users questions about our screen displays. Third, when we go back to our institutions, we have all of our other regular responsibilities, administrative hassles, and so on. To come here and to deal only with these issues energizes me immensely. It's an inspiration.

Nitecki: It seems to me that retrieval of information about a library's holdings and bibliographic verification data is not an instinctive activity, but is rather one existing within an educational environment. Using a library catalog (online or print) is a learned process and the language surrounding it is also learned--learned at varied levels of sophistication, for varied purposes. Thus, rather than striving to design a system for the least common denominator of user (which may be a relatively illiterate one), I think the system should aim to raise the users' knowledge by educating them through exposure to and use of an intricate retrieval system. The education and thus the screens might be simplistic at first, but can evolve, with "engaging use," to more intricate communication. Thus a screen display both builds upon and contributes to the user's educational experience.

At the same time, for economic reasons, many public services librarians may not have the luxury to be able to revise the systems serving their users. However, a greater awareness of potential user problems, as illustrated, for example, by the research on human interface, may help us better assist and better instruct users on how to retrieve and interpret the information the system offers and the screen displays.

Finally, I echo C. C. and Alan's observation that there is a fair amount of sameness in screen displays and welcome greater creativity in their design. In this context, Chris' comments about the role of the mental model triggered two tangents for me. One is for the screen design, the other for instruction for the use of any screen and system. For either purpose, have we utilized the card catalog metaphor as the most successful one to assist people to retrieve holding information or have we used it as a default? That may be one challenge to explore more fully--what other mental associations can help people through the process to identify such information?

Lipow: To summarize my thinking, I wrote a song. Just to prove to you that I'm not totally against guidelines, I've entitled it "Guidelines for Screens."

GUIDELINES FOR SCREENS

[Sung to the tune of Humoresque]

Say it short and say it clearly.
  Make the length of labels merely
12-20 characters, no more.

  Keep the users always knowing
Where they are and where they're going;
  Form a healthy system metaphor.

"Cluttered screens are such a mess
  and cause the users undue stress,"
Mental modeler Christine Borgman writes.

  So when thinking 'bout your path, use
Only screens endorsed by Matthews;
  Thus your OPAC's will attain new heights.

CLR's refined our role, then.
  User intimate's our goal, then.
Let's go home and use what we now know.

  After all is said and over
One small problem's left to cover--
  Where--oh where--to find sufficient dough?

Anne Lipow

APPENDICES

APPENDIX A

GLOSSARY

Walt Crawford

Editor's Note: The following definitions were originally prepared by Walt Crawford to accompany his staff report on conference issues and activities. They have been included here in an attempt to clarify jargon for the uninitiated.

Authority: Typically used here to mean "heading" or "index display."

Autochain: To go directly to a "later" step due to search results. Primary example: if a search yields a single result, display that result in a "brief" display, rather than providing a multiple record display with only one record.

Brief: A single-record display including some level of bibliographic information and, frequently, call number, location, and status.

Chunking: People's ability to retain 7 pieces of information (plus or minus 2) in short-term memory.

Copy: A display devoted primarily (or solely) to holdings and status information. Should include some level of bibliographic information. In some systems, "Brief" and "Copy" are the same display.

Derived-key: A fixed-length search key made up of portions of one or more words of a field--OCLC search keys, for instance.

Column-indented: When bibliographic elements all begin in the same column, to the right of the longest label. Multiline elements may or may not be further indented.

Echo: To show the entered command on the resulting screen, including spelled-out versions of menu options or function keys.

Green out: To suffer from too many different video displays over too short a time.

Long: The most complete bibliographic display, in some form **other than tagged MARC**, usually either "cardlike" or "labeled". Alternatively "full" may be used, although "FUL" means "tagged MARC" in some systems.

MARC displays: Displays including tags, indicators, and subfield codes.

MUL: Abbreviation for "multiple-record display"; any display showing more than one bibliographic entry (as opposed to more than one heading).

OPAC: Online Patron Access Catalog. For this conference the term was used broadly to include circulation systems with patron access, and even one system which is closer to a bibliographic search system (for articles, papers, etc.) than to the usual meaning of "OPAC".

Postings: A number representing records which have this heading.

Ravel: A response to implicit or explicit Boolean searching wherein the results for each word are displayed while the search is proceeding. This may or may not be followed by intermediate-combination results, but terminates with a final result (usually).

SDI: Selective Dissemination of Information. Alan Kay was really talking about SDI when he described "an agent in the catalog, looking for new items that interest me and sending me mail whenever such items show up."

Signposts: A general term for information showing how you got where you are, and identifying where you are. Includes echoing and screen names.

Spatial expectations: Where types of information would be expected (by the user) to appear on a screen.

Uplow: Abbreviation for "upper and lower case", just as "upper" is an abbreviation for "appearing in all capital letters".

APPENDIX B

ONLINE CATALOG SCREEN DISPLAYS

A Conference Sponsored By
The Council on Library Resources
Washington, D.C.

LAKEWAY CONFERENCE CENTER
101 Lakeway Drive
Austin, Texas 78734

MARCH 10-13, 1985

DETAILED AGENDA

Sunday, March 19, 1985

BRAZOS AND PECOS ROOMS

3:00 - 600 PM	Set-up for Demonstrations
6:00 - 6:30	Relaxation Break
6:30 - 8:00	Hamburger Cookout - LOWER TERRACE

Monday, March 11, 1985

BRAZOS AND PECOS ROOMS

9:00 - 9:30 AM	Registration/Introductions/Coffee
9:30 - 12:00 Noon	Part One - Oneline Catalog Fair 12 Systems Available for Review of Screens
12:00 - 1:00 PM	Box Lunches - LOWER TERRACE
1:00 - 3:30	Part Two - Online Catalog Fair 11 Additional Systems Available for Review of Screens
3:30 - 4:00	Break - Coffee/Soft Drinks

PECOS ROOM

4:00 - 4:15	Conference Overview - Lee Jones
4:15 - 5:00	Online Catalog Screen Displays: Research Results - Joe Matthews

Monday - continued

5:00 7:00 PM	Relaxation Break

VISTA ROOM

7:00 - 7:30	Librations - Beer, Wine, Soft Drinks
7:30 - 9:30	Tex-Mex Buffet and Discussions

Tuesday, March 12, 1985

PECOS ROOM

8:00 - *:30 AM	Continental Breakfast
8:30 - 9:30	Displays in Database Search Systems Fran Spigai
9:30 - 10:15	Critizue of Screens from Online Catalog Fair - Kent Norman
10:15 - 10:45	Coffee Break
10:45 - 11:30	Critizue of Screens from Online Catalog Fair - Christine Borgman
11:30 - 12:00 Noon	Discussion
12:00 - 1:00 PM	Sandwich Platters - DINING ROOM ALCOVE
1:00 - 2:00	Bit-Mapped Displays and Online Catalogs Alan Kay
2:00 - 5:00	Group Discussions Principles of Online Displays What Guidelines are Required? Nature of Guidelines Future Directions of Online Displays Action Required
5:00 - 6:30	Relaxation Break

UPPER SWIMMING POOL

6:30 - 7:00	Libations - Beer, Wine, Soft Drinks
7:00 - 9:00	Texas T-Bone Dinner -- Discussion Groups Continue Dialogue

Wednesday, March 13, 1985

PECOS ROOM

8:00 - 8:30 AM	Continental Breakfast
8:30 - 9:30	Reports from Discussion Groups
9:30 - 10:30	Discussion/Suggestions/Recommendations
10:30 - 10:45	Coffee Break
10:45 - 11:15	Summary and Next Steps
11:15 - 11:45	Critique of Conference

LOWER TERRACE

11.45	Box Lunches Available.

HEAD FOR HOME -- TRAVEL SAFELY

APPENDIX C

LIST OF PARTICIPANTS

ONLINE CATALOG SCREEN DISPLAY CONFERENCE

Lakeway Conference Center
Austin, Texas

March 10 - 13, 1985

1.	**ALLEN,** Noreen	DataPhase Systems	913/262-5100
2.	**ARRET,** Linda	Library of Congress	202/287-1490
3.	**BISOM,** Dianne	UCLA	213/825-7557
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LIST OF PARTICIPANTS

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40.	**SPIGAI**, Fran	Database Services	415/948-8339
41.	**WALTON**, Robert	Texas State Library	512/475-2166
42.	**WILLIAMS**, Joan	J. Matthews & Associates	916/272-8743
43.	**WILLIS**, Eric	GEAC	416/475-0525

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